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VOLUME 23 / NUMBER 2
JANUARY 23, 1985
ACC. NOS. N85-10907 TO N85-11975

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Scientific and Technical Aerospace Reports, Volume 23, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

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US ISSN 0036-8741

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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 295
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION N.A.
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

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89 ASTRONOMY 296
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 297
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 298
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 303
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 305
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

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99 GENERAL 305

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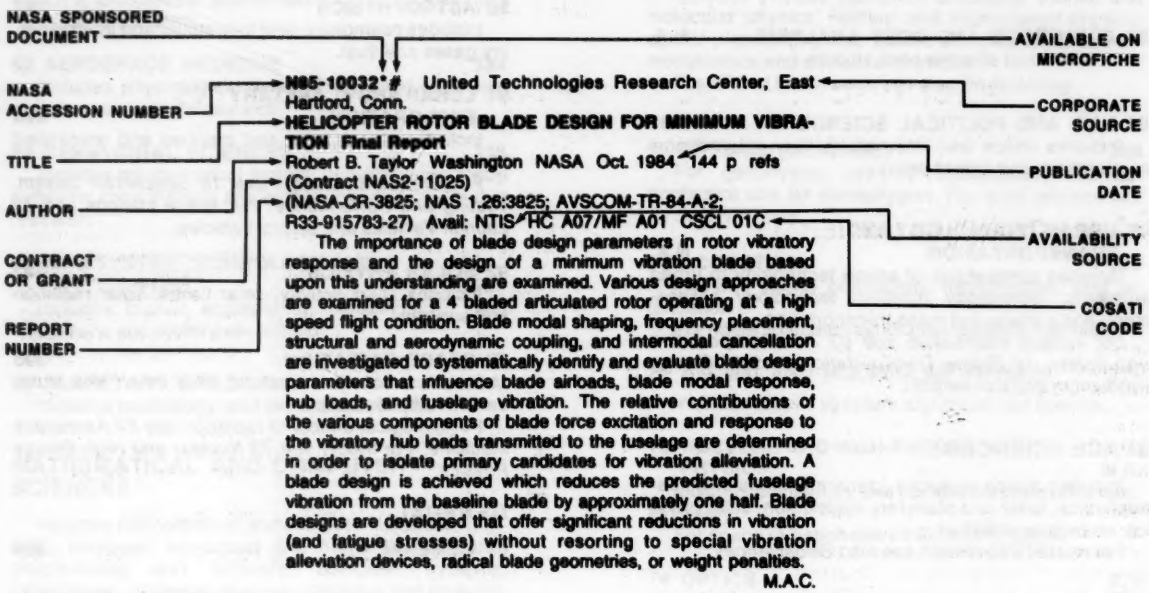
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NASA ACCESSION NUMBER
N85-10032*# United Technologies Research Center, East Hartford, Conn.
CORPORATE SOURCE
TITLE
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
PUBLICATION DATE
AUTHOR
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
CONTRACT OR GRANT
(Contract NAS2-11025)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 2 / JANUARY 23, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-10907*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FOREIGN CIVIL AVIATION COMPETITION: 1976 SUMMARY AND IMPLICATIONS
William J. Alford, Jr. (comp.) and Dal V. Maddalon (comp.) 17 Jun. 1976 48 p
(NASA-TM-X-73907; NAS 1.15:X-73907) Avail: NTIS HC A03/MF A01 CSCL 01B

A summary assessment is made of foreign civil aviation as it relates to the posture of the United States civil aviation industry. Major findings include: (1) Main competitors - European Economic Community (EEC) and Union of Soviet Socialist Republics (USSR). (2) Largest commercial market - Transport aircraft. (3) Current market status and projections - U.S. currently dominates the civil aviation market but foreign markets show greater growth trends. (4) Competitive comparisons - Status comparisons are made in technology (aerodynamics, structures and materials, propulsion, avionics, systems, design coordination, and manufacturing); production runs; marketing; and postsales support. The U.S. generally leads except in aerodynamics and propulsion. (5) Multinational ventures - Joint U.S. industry/foreign government development of advanced technology engines is well developed; airframe industry discussions are now underway. (6) Implications - Although the U.S., is currently preeminent in most areas, this may be only a temporary condition. Past U.S. success in aviation has provided many benefits to the nation. These benefits may be lost. M.A.C.

N85-10908*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACEE PROGRAM RATIONALE AND IMPLEMENTATION
William S. Aiken, Jr. and Richard H. Petersen Aug. 1982 34 p Presented at the ACEE Project Oral Status Rev., Edwards AFB, Calif., 14 Sep. 1981
(NASA-TM-84549; NAS 1.15:84549) Avail: NTIS HC A03/MF A01 CSCL 01B

The impact of the Aircraft Energy Efficiency program (ACEE) on commercial aviation is examined. In addition to the emphasis on air transport fuel efficiency, topics such as airline operating costs, air transport effects on U.S. trade, and fuel price forecasts are addressed. An overview of the program and its contribution to aviation technology is included. M.A.C.

N85-10909*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FUEL EFFICIENCY THROUGH NEW AIRFRAME TECHNOLOGY
Robert W. Leonard Aug. 1982 155 p
(NASA-TM-84548; NAS 1.15:84548) Avail: NTIS HC A08/MF A01 CSCL 01B

In its Aircraft Energy Efficiency Program, NASA has expended approximately 200 million dollars toward development and application of advanced airframe technologies to United States's commercial transports. United States manufacturers have already been given a significant boost toward early application of advanced composite materials to control surface and empennage structures and toward selected applications of active controls and advanced aerodynamic concepts. In addition, significant progress in definition and development of innovative, but realistic systems for laminar flow control over the wings of future transports has already been made. Author

N85-10910*# General Dynamics Corp., Fort Worth, Tex.
AN ENGINE TRADE STUDY FOR A SUPERSONIC STOVL FIGHTER-ATTACK AIRCRAFT, VOLUME 1 Final Report, Jun. 1981 - Feb. 1982
B. B. Beard and W. H. Foley Feb. 1982 74 p refs
(Contract NAS2-10981)
(NASA-CR-166304; NAS 1.26:166304) Avail: NTIS HC A04/MF A01 CSCL 01B

The best main engine for an advanced STOVL aircraft flight demonstrator was studied. The STOVL aircraft uses ejectors powered by engine bypass flow together with vectored core exhaust to achieve vertical thrust capability. Bypass flow and core flow are exhausted through separate nozzles during wingborne flight. Six near term turbofan engines were examined for suitability for this aircraft concept. Fan pressure ratio, thrust split between bypass and core flow, and total thrust level were used to compare engines. One of the six candidate engines was selected for the flight demonstrator configuration. Propulsion related to this aircraft concept was studied. A preliminary candidate for the aircraft reaction control system for hover attitude control was selected. A mathematical model of transfer of bypass thrust from ejectors to aft directed nozzle during the transition to wingborne flight was developed. An equation to predict ejector secondary air flow rate and ram drag is derived. Additional topics discussed include: nozzle area control, ejector to engine inlet reingestion, bypass/core thrust split variation, and gyroscopic behavior during hover. E.A.K.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-10911 Mississippi State Univ., Mississippi State.
EMBEDDED-GRID GENERATION WITH COMPLETE CONTINUITY ACROSS INTERFACES FOR MULTI-ELEMENT AIRFOILS Ph.D. Thesis
Sunil Kumar Jain 1984 69 p
Avail: Univ. Microfilms Order No. DA8415732

An algorithm is developed to obtain embedded grid systems for multielement airfoils. The grid generating equations used are the elliptic equations developed by Thompson, et al., to generate

boundary fitted curvilinear coordinate systems about an arbitrary two dimensional body. These equations are solved by a point SOR method. The physical region is divided into various simple or doubly connected subregions. An SOR iteration is performed first in the various subregions and then on the subregion's nonphysical boundaries. Thus a complete continuity of grid lines is maintained across these boundaries. The expression for the control functions at the boundaries are obtained by taking the projection of grid generating equations of the boundaries. These are further simplified by assuming the orthogonality condition and the zero curvature of the transverse grid line at each boundary point. The resulting expressions are evaluated using the point distribution along the boundary and the specified spacing of the first grid line of the boundary. Dissert. Abstr.

N85-10912 California Inst. of Tech., Pasadena.
EXPERIMENTS ON TURBULENT MIXING AND CHEMICAL REACTIONS IN A LIQUID MIXING LAYER Ph.D. Thesis
Manoochehr Mohseni Koochesfahani 1984 155 p
Avail: Univ. Microfilms Order No. DA8414985

The processes of entrainment and mixing are investigated in reacting and nonreacting, uniform density, liquid mixing layers over a wide range of Reynolds numbers. The diagnostics are based entirely on the laser induced fluorescence technique. The vortical structures in the mixing layer initially roll up with a large excess of high speed fluid in the cores. During the mixing transition, not only does the amount of mixed fluid increase, but the composition also changes. The turbulent transport in the cases studied, is dominated by large scale structures and is not adequately described by standard gradient diffusion models. The mean concentration of the mixed fluid for a mixing layer at a velocity ratio of 0.38, becomes constant at 0.57 above the mixing transition. This corresponds to an entrainment ratio of 1.32, in agreement with the gaseous result of Konrad at the same velocity ratio. Dissert. Abstr.

N85-10913*# California Univ., Los Angeles, Dept.of Mathematics.
SHOCK CAPTURING FINITE DIFFERENCE ALGORITHMS FOR SUPERSONIC FLOW PAST FIGHTER AND MISSILE TYPE CONFIGURATIONS Annual Status Report, 1 Mar. 1984 - 28 Feb. 1985
Stanley J. Osher [1984] 7 p refs
(Grant NAG1-270)
(NASA-CR-174051; NAS 1.26:174051) Avail: NTIS HC A02/MF A01

The construction of a reliable, shock capturing finite difference method to solve the Euler equations for inviscid, supersonic flow past fighter and missile type configurations is highly desirable. The numerical method must have a firm theoretical foundation and must be robust and efficient. It should be able to treat subsonic pockets in a predominantly supersonic flow. The method must also be easily applicable to the complex topologies of the aerodynamic configuration under consideration. The ongoing approach to this task is described and for steady supersonic flows is presented. This scheme is the basic numerical method. Results of work obtained during previous years are presented. B.W.

N85-10914*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRANSONIC FLOW ANALYSIS FOR ROTORS. PART 1: THREE-DIMENSIONAL QUASI-STEADY, FULL-POTENTIAL CALCULATION
I-Chung Chang Oct. 1984 87 p refs
(NASA-TP-2375; A-9721; NAS 1.60:2375) Avail: NTIS HC A05/MF A01 CSCL 01A

A new computer program is presented for calculating the quasi-steady transonic flow past a helicopter rotor blade in hover as well as in forward flight. The program is based on the full potential equations in a blade attached frame of reference and is capable of treating a very general class of rotor blade geometries. Computed results show good agreement with available experimental data for both straight and swept tip blade geometries. Author

N85-10915*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARACTERISTIC BOUNDARY CONDITIONS FOR THREE-DIMENSIONAL TRANSONIC UNSTEADY AERODYNAMICS
Woodrow Whitlow, Jr. Oct. 1984 12 p refs
(NASA-TM-86292; NAS 1.15:86292) Avail: NTIS HC A02/MF A01 CSCL 01A

Characteristic far-field boundary conditions for the three-dimensional unsteady transonic small disturbance potential equation have been developed. The boundary conditions were implemented in the XTRAN3S finite difference code and tested for a flat plate rectangular wing with a pulse in angle of attack; the freestream Mach number was 0.85. The calculated force response shows that the characteristic boundary conditions reduce disturbances that are reflected from the computational boundaries. Author

N85-10916*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIFTING SURFACE THEORY FOR A HELICOPTER ROTOR IN FORWARD FLIGHT
H. Tai and Harry L. Runyan Sep. 1984 13 p refs Presented at the 2nd Decennial Specialists' Meeting on Rotorcraft Dyn., Moffett Field, Calif., 7-9 Nov. 1984
(NASA-TM-86315; NAS 1.15:86315) Avail: NTIS HC A02/MF A01 CSCL 01A

A lifting surface theory was developed for a helicopter rotor in forward flight for compressible and incompressible flow. The method utilizes the concept of the linearized acceleration potential and makes use of the vortex lattice procedure. Calculations demonstrating the application of the method are given in terms of the lift distribution on a single rotor, a two-bladed rotor, and a rotor with swept-forward and swept-back tips. In addition, the lift on a rotor which is vibrating in a pitching mode at 4/rev is given. Compressibility effects and interference effects for a two-bladed rotor are discussed. Author

N85-10917*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FITTING AERODYNAMIC FORCES IN THE LAPLACE DOMAIN: AN APPLICATION OF A NONLINEAR NONGRADIENT TECHNIQUE TO MULTILEVEL CONSTRAINED OPTIMIZATION
Sherwood H. Tiffany and William M. Adams, Jr. Oct. 1984 24 p refs
(NASA-TM-86317; NAS 1.15:86317) Avail: NTIS HC A02/MF A01 CSCL 01A

A technique which employs both linear and nonlinear methods in a multilevel optimization structure to best approximate generalized unsteady aerodynamic forces for arbitrary motion is described. Optimum selection of free parameters is made in a rational function approximation of the aerodynamic forces in the Laplace domain such that a best fit is obtained, in a least squares sense, to tabular data for purely oscillatory motion. The multilevel structure and the corresponding formulation of the objective models are presented which separate the reduction of the fit error into linear and nonlinear problems, thus enabling the use of linear methods where practical. Certain equality and inequality constraints that may be imposed are identified; a brief description of the nongradient, nonlinear optimizer which is used is given; and results which illustrate application of the method are presented. Author

N85-10918*# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aero. Engineering.
FORCE AND MOMENT MEASUREMENTS ON A 74 DEG DELTA WING WITH AN APEX FLAP
Thomas A. Buter and Dhanvada M. Rao (Vigyan Research Associates, Inc., Hampton, Va.) Hampton, Va. NASA. Langley Research Center Oct. 1984 23 p refs
(Contract NCC1-46)
(NASA-CR-166081; NAS 1.26:166081) Avail: NTIS HC A02/MF A01 CSCL 01A

Results are presented of a subsonic experimental investigation of an apex flap concept on a 74 deg swept delta wing with

trailing-edge flaps. The apex flap comprised approximately 6 percent of the wing area forward of a transverse hinge, allowing for upward and downward deflection angles from +40 deg to -20 deg. Upward deflection forces leading-edge vortex formation on the apex flap, resulting in an increased lift component on the apex area. The associated nose-up moment balances the nose-down moment due to trailing-edge flaps, resulting in sizeable increase in the trimmed lift coefficient particularly at low angles of attack. Nose-down apex deflection may be used to augment the pitch control for rapid recovery from high-alpha maneuvers. This report presents the balance data without analysis. B.W.

N85-10919*# Ohio State Univ., Columbus.
DESIGN AND WIND TUNNEL EVALUATION OF A SYMMETRIC AIRFOIL SERIES FOR LARGE WIND TURBINE APPLICATIONS Final Report
G. M. Gregorek May 1984 27 p refs
(Grant NAG3-330; Contract DE-AI01-76ET-20320)
(NASA-CR-174764; DOE/NASA/0330-1; NAS 1.26:174764) Avail: NTIS HC A03/MF A01 CSCL 01A

A family of symmetric airfoils with thickness to chord ratios of 0.21, 0.25, and 0.29 was designed for applications to large wind turbines using the Eppler analytic design methodology. The airfoil series, designed for Reynolds numbers above 4x1,000,000, has a contour that maintains its thickness to the 0.7 chord position, allowing use of a deep aft spar for structural integrity. Wind tunnel tests of the 21 percent thick airfoil conducted in the Ohio State University Airfoil Test Facilities at M = 0.25 and Re = 2, 4 and 8x1,000,000 showed good agreement with predicted surface pressures and lift and drag coefficients when the angle of attack was low and the Reynolds number was 8x1,000,000. At the lowest Reynolds number, both the measured lift curve slope and the maximum lift coefficient differ significantly from theory. In the post stall region, agreement with theory and experiment is poor, at all Reynolds numbers, verifying the need for improved analytic methods in this important flow regime. Author

N85-10920*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL TRIM DRAG VALUES AND FLOW-FIELD MEASUREMENTS FOR A WIDE-BODY TRANSPORT MODEL WITH CONVENTIONAL AND SUPERCRITICAL WINGS
Peter F. Jacobs Oct. 1982 142 p refs
(NASA-TP-2071; L-15315; NAS 1.60:2071) Avail: NTIS HC A07/MF A01 CSCL 01A

The purpose of this study was to determine if advanced supercritical wings incur higher trim drag values at cruise conditions than current wide body technology wings. Relative trim drag increments were measured in an experimental wind tunnel investigation conducted in the Langley 8 Foot Transonic Pressure Tunnel. The tests utilized a high aspect ratio supercritical wing and a wide body aircraft wing, in conjunction with five different horizontal tail configurations, mounted on a representative wide body fuselage. The three low tail and two T-tail configurations were designed to measure the effects of horizontal tail size, location, and camber on the trim drag increments for the two wings. Longitudinal force and moment data were taken at a Mach number of 0.82 and design cruise lift coefficients for the wide body and supercritical wings of 0.45 and 0.55, respectively. The data indicate that the supercritical wing does not have significantly higher trim drag than the wide body wing. A reduction in tail size, combined with relaxed static stability, produced trim drag reductions for both wings. The cambered tails had higher trim drag increments than the symmetrical tails for both wings, and the T-tail configurations had lower trim drag increments than the low tail configurations. Author

N85-10921*# Kansas Univ. Center for Research, Inc., Lawrence.
VORCOR: A COMPUTER PROGRAM FOR CALCULATING CHARACTERISTICS OF WINGS WITH EDGE VORTEX SEPARATION BY USING A VORTEX-FILAMENT AND-CORE MODEL
Jenn-Louh Pao, Sudhir C. Mehrotra (Vigyan Research Associates, Inc.), and C. Edward Lan Apr. 1982 242 p
(Contracts NAS1-16114; NCC1-18)
(NASA-CR-165902; NAS 1.26:165902) Avail: NTIS HC A11/MF A01 CSCL 01A

A computer code base on an improved vortex filament/vortex core method for predicting aerodynamic characteristics of slender wings with edge vortex separations is developed. The code is applicable to camber wings, straked wings or wings with leading edge vortex flaps at subsonic speeds. The prediction of lifting pressure distribution and the computer time are improved by using a pair of concentrated vortex cores above the wing surface. The main features of this computer program are: (1) arbitrary camber shape may be defined and an option for exactly defining leading edge flap geometry is also provided; (2) the side edge vortex system is incorporated. M.A.C.

N85-10922*# Boeing Military Airplane Development, Seattle, Wash.
PAN AIR: A COMPUTER PROGRAM FOR PREDICTING SUBSONIC OR SUPERSONIC LINEAR POTENTIAL FLOWS ABOUT ARBITRARY CONFIGURATIONS USING A HIGHER ORDER PANEL METHOD. VOLUME 3: CASE MANUAL (VERSION 1.0) Contractor Report, Jan. 1978 - Jun. 1981
Richard T. Medan, ed., Alfred E. Magnus, Kenneth W. Sidwell, and Michael A. Epton Washington NASA Aug. 1981 237 p refs Sponsored in part by AF and Navy
(Contract NAS2-9830)
(NASA-CR-3253; NAS 1.26:3253) Avail: NTIS HC A11/MF A01 CSCL 01A

Numerous applications of the PAN AIR computer program system are presented. PAN AIR is user-oriented tool for analyzing and/or designing aerodynamic configurations in subsonic or supersonic flow using a technique generally referred to as a higher order panel method. Problems solved include simple wings in subsonic and supersonic flow, a wing-body in supersonic flow, wing with deflected flap in subsonic flow, design of two-dimensional and three-dimensional wings, axisymmetric nacelle in supersonic flow, and wing-canard-tail-nacelle-fuselage combination in supersonic flow. Author

N85-10923# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
WIND TUNNEL CALIBRATION OF A HEMISPHERICAL HEAD ANGLE OF ATTACK AND ANGLE OF SIDESLIP INDICATOR
Jan Nordstroem 29 Feb. 1984 55 p refs
(Contracts FMV-FlygFl-82223-78-003-21-001; FMV-FL-K-82223-80-001-21-001; FMV-FL-K-82223-80-181-21-001; FMV-FL-K-82223-81-158-25-001; FMV-FL-K-82260-83-053-25-001)
(FFA-TN-1984-11) Avail: NTIS HC A04/MF A01

A hemispherical head with 5 pressure taps at 45 deg in 2 planes was manufactured and calibrated at appropriate angles of incidence for actual Mach numbers, to indicate angle of attack and angle of sideslip in a flight test. Calibration results, direct test results and final calibration equations to be used in flight are given. Reynolds number dependence was explored and error analysis carried out. Author (ESA)

N85-11702# Joint Publications Research Service, Arlington, Va.
PROBLEM OF REDUCTION TO IDEAL WIND TUNNEL IN EXPERIMENTAL AERODYNAMICS Abstract Only
N. N. Yanenko, Yu. Ye. Voskoboynikov, and N. G. Preobrazhenskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 48 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1309-1312 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11703# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF MACH REFLECTION OF WEAK SHOCK WAVES Abstract Only
G. A. Makarevich, G. S. Lisenkova, N. A. Tikhomirov, and A. V. Khodtsev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 49 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 625-628 (For primary

document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11739# Joint Publications Research Service, Arlington, Va.
COLLAPSE OF CAVITATION BUBBLES BETWEEN TWO WALLS IN ULTRASONIC FIELD Abstract Only
N. V. Dezhkunov, G. I. Kuvshinov, and P. P. Prokhorenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 4 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 6, Nov. - Dec. 1983 p 754-757 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11755# Joint Publications Research Service, Arlington, Va.
GEOMETRIC CHARACTERISTICS OF TURBULENT BOUNDARY LAYER SEPARATION UPON ACTION WITH DIRECT SHOCK WAVE IN CONICAL FLOWS Abstract Only
M. A. Zubin and N. A. Ostapenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Mar. 1984 p 38 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 6, Nov. - Dec. 1983 p 43-51 Original language document was announced as A84-19555 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11757# Joint Publications Research Service, Arlington, Va.
DENSITY DISTRIBUTION IN SUPERSONIC JET DISCHARGED INTO VACUUM FROM NOZZLE WITH BEVEL TIP Abstract Only
A. V. Rodionov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 39 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 6, Nov. - Dec. 1983 p 179-180 Original language document was announced as A84-19571 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-10924# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORT. CENTRAL AIRLINES FLIGHT 27, HUGHES CHARTER AIR, GATES LEARJET MODEL 25 (N51CA) NEWARK INTERNATIONAL AIRPORT, NEWARK, NEW JERSEY, MARCH 30, 1983
7 Aug. 1984 31 p
(PB84-910411; NTSB-AAR-84-11) Avail: NTIS HC A03/MF A01 CSCL 01C

About 0514, eastern standard time, on March 30, 1983, Central Airlines Flight 27, a Gates Learjet model 25 (N51CA), with two pilots aboard crashed at Newark International Airport, Newark, New Jersey, during a landing attempt on runway 4 right. The airplane was destroyed by impact, and the two pilots died as a result of the accident. The airplane came to rest in a drainage ditch at the airport perimeter. A ground fire erupted near the latter portion of the impact area. The National Transportation Safety Board determines that the probable causes of this accident were: (1) loss of control following ground contact; (2) an unstabilized approach; and (3) impairment of the flightcrew's judgment, decision making, and flying abilities by a combination of physiological and psychological factors. Author

N85-10925# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT: FLYING TIGERS, INC., FLIGHT 2468, MCDONELL DOUGLAS DC8-63, N797FT, CHAMBERS FIELD, NAVAL AIR STATION, NORFOLK, VIRGINIA, OCTOBER 25, 1983
30 May 1984 53 p
(PB84-910408; NTSB-AAR-84-08) Avail: NTIS HC A04/MF A01

An accident involving a DC 8 aircraft is discussed in detail. Pilot decisions, air traffic control, airspeed, runway conditions, and weather conditions are among the aspects of the accident given consideration. Flight crew preparedness and training and damage to the aircraft are also mentioned. The probable causes of the mishap as determined by the National Transportation Safety Board are provided. R.S.F.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-10926# Engineering and Economics Research, Inc., Vienna, Va.
NATIONAL AIRSPACE REVIEW Interim Report
Jun. 1984 101 p
Avail: NTIS HC A06/MF A01

Background information is given concerning the evolution of a program to review airspace allocations and air traffic control procedures in order to enable the FAA to identify and implement changes which can promote greater efficiency of all airspace users and simplify the system. The processes developed to undertake three distinct phases of the project are outlined and the activities that are being performed to accomplish the group's objectives are described. Accomplishments to date are identified and the phasing of system enhancements is defined based on Agency processing requirements and system needs. Recommendations for the terminal, en route, and flight services systems are advanced, as well as those for the airspace system structure and regulations and standards. A.R.H.

N85-10927*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
ENHANCED TCAS 2/CDTI TRAFFIC SENSOR DIGITAL SIMULATION MODEL AND PROGRAM DESCRIPTION Final Report
Tsuyoshi Goka Oct. 1984 175 p refs
(Contract NAS1-16135)
(NASA-CR-172445; NAS 1.26:172445) Avail: NTIS HC A08/MF A01 CSCL 17G

Digital simulation models of enhanced TCAS 2/CDTI traffic sensors are developed, based on actual or projected operational and performance characteristics. Two enhanced Traffic (or Threat) Alert and Collision Avoidance Systems are considered. A digital simulation program is developed in FORTRAN. The program contains an executive with a semireal time batch processing capability. The simulation program can be interfaced with other modules with a minimum requirement. Both the traffic sensor and CAS logic modules are validated by means of extensive simulation runs. Selected validation cases are discussed in detail, and capabilities and limitations of the actual and simulated systems are noted. The TCAS systems are not specifically intended for Cockpit Display of Traffic Information (CDTI) applications. These systems are sufficiently general to allow implementation of CDTI functions within the real systems' constraints. M.A.C.

N85-10928# Royal Aircraft Establishment, Farnborough (England).
SOME NOTES ON A TANGENT PLANE ORIENTED HEADING REFERENCE
C. J. B. Dormon Dec. 1966 21 p
(RAE-TM-IEE-144; BR92359) Avail: NTIS HC A02/MF A01

The problem of heading errors due to gravity sensitive gyro drifts occurring in a tangent plane oriented stabilized platform is

considered. Expressions for the errors when the platform is moving towards and away from the tangent point are obtained. Suggestions for reducing these errors are made. Author (ESA)

N85-10929# Martin Marietta Aerospace, Washington, D.C. Air Traffic Control Div.
SYSTEM ENGINEERING AND INTEGRATION CONTRACT FOR IMPLEMENTATION OF THE NATIONAL AIRSPACE SYSTEM PLAN. VOLUME 2: SECTION 5.0 NAS Plan Audit Report
Aug. 1984 211 p
(Contract DTFA01-84-C-00017)
(AD-A145710; ATC-84-0026-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 17/7

This section provides the detailed audit findings for each of the NAS Plan F&E projects. The individual sections are arranged to follow the sequence and order of the technical program chapters in the NAS Plan. The text on each project is formatted to describe: (1) Project role in the National Airspace System. (2) The products that will be produced by the project. (3) The status of the project. (4) The major audit findings broken into technical, schedule, and cost if appropriate. (5) Recommendations to help achieve a successful project on schedule. GRA

N85-10930# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Entwicklung Navigation.
USE OF MICROPROCESSOR TECHNIQUES AND NEW ANTENNA SYSTEMS TO IMPROVE THE NAVIGATION AIDS VERY HIGH FREQUENCY OMNIDIRECTIONAL RADAR (VOR), DOPPLER VOR AND INSTRUMENT LANDING SYSTEM (ILS) Final Report, Dec. 1982
Herbert Kleiber Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-026; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Prototypes of Very High Frequency Omnidirectional Range (VOR), Doppler-VOR (DVOR), and Instrument Landing System (ILS) equipments are described. Digital signal processing with a 16-bit microprocessor was used for signal generation of sinusoidal modulation wave forms. Generated and radiated signals were monitored by application of time discrete systems and digital filtering. Increased efficiency and simplified maintenance are outlined. The antenna system comprises a VOR antenna with reduced cone of silence, a DVOR antenna with switch gear for 50 side-band antennas according to the double sideband principle, and a modular heading antenna. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-10931 Virginia Polytechnic Inst. and State Univ., Blacksburg.
ON-BOARD NEAR-OPTIMAL CLIMB-DASH ENERGY MANAGEMENT Ph.D. Thesis
Alan Weston 1983 125 p
Avail: Univ. Microfilms Order No. DA8415977

A method suitable for an onboard guidance system is presented which makes use of the ideas that the energy determines the optimal attitude and path angle, and trajectories which do not initially lie on the optimal schedule rapidly fair into it. (The optimal schedule is an Euler solution to the two point boundary value problem, found by a multiple shooting technique). This transition which occurs instantaneously in the energy model, is approximated by the use of a feedback control law. The gains are determined by numerical differentiation about the nominal optimal path. Once the nominal path and the feedback gains have been found as functions of energy, they are represented using cubic splines for real time implementation, requiring minimal onboard computational and storage capabilities. The problem which was studied was to maximize range in symmetric flight with fuel open. Some computational results are presented comparing the paths generated by the feedback law to Euler solutions from the same point.
Dissert. Abstr.

N85-10932*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROLE OF RESEARCH AIRCRAFT IN TECHNOLOGY DEVELOPMENT Final Report
Kenneth J. Szalai 1984 30 p refs Presented at the AIAA/AHS/ASEE Aircraft Design Systems and Operation Meeting, 31 Oct. - 2 Nov. 1984, San Diego, Calif.
(NASA-TM-85913; H-1265; NAS 1.15:85913;
AIAA-Paper-A84-2473) Avail: NTIS HC A03/MF A01 CSCL 01C

The United States's aeronautical research program has been rich in the use of research aircraft to explore new flight regimes, develop individual aeronautical concepts, and investigate new vehicle classes and configurations. This paper reviews the NASA supercritical wing, digital fly-by-wire, HiMAT, and AD-1 oblique-wing flight research programs, and draws from these examples general conclusions regarding the role and impact of research aircraft in technology development. The impact of a flight program on spinoff technology is also addressed. The secondary, serendipitous results are often highly significant. Finally, future research aircraft programs are examined for technology trends and expected results. Author

N85-10933*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
HYBRID LAMINAR FLOW CONTROL STUDY Final Technical Report
Oct. 1982 166 p refs
(Contract NAS1-15325)
(NASA-CR-165930; NAS 1.26:165930; D6-49359) Avail: NTIS HC A08/MF A01 CSCL 01C

Hybrid laminar flow control (HLFC) in which leading edge suction is used in conjunction with wing pressure distribution tailoring to postpone boundary layer transition and reduce friction drag was examined. Airfoil design characteristics required for laminar flow control (LFC) were determined. The aerodynamic design of the HLFC wing for a 178 passenger commercial turbofan transport was developed, and a drag was estimated. Systems changes required to install HLFC were defined, and weights and fuel economy were estimated. The potential for 9% fuel reduction for a 3926-km (2120-nmi) mission is identified. E.A.K.

N85-10934*# Boeing Commercial Airplane Co., Seattle, Wash.
ADVANCED COMPOSITE STABILIZER FOR BOEING 737 AIRCRAFT Quarterly Technical Progress Report, 19 Jul. 1978 - 18 Oct. 1978
[1978] 28 p refs
(Contract NAS1-15025)
(NASA-CR-168451; NAS 1.26:168451; DRL-018; QTPR-5) Avail: NTIS HC A03/MF A01 CSCL 01C

Activities related to development of an advanced composites stabilizer for the Boeing 737 commercial transport are reported. Activities include discussion of the design and weight status, stiffness requirements, the finite element model, test programs, quality assurance, and manufacturing producibility studies. Design details of the graphite/epoxy components are virtually complete. Emphasis is placed on the metal and fiberglass trailing edge components. The bending and torsional stiffness properties are satisfactory for both stability/control and for flutter requirements. The finite element model input geometry is revised to reflect the latest changes to production drawings. M.A.C.

N85-10935*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
AIRCRAFT SURFACE COATINGS Final Summary Report, Aug. 1977 - Feb. 1982

Washington NASA Jan. 1983 34 p refs
(Contracts NAS1-14742; NAS1-15325)
(NASA-CR-3661; NAS 1.26:3661; D6-51151) Avail: NTIS HC A03/MF A01 CSCL 01C

A series of studies in which films and liquid spray-on materials were evaluated in the laboratory for transport aircraft external surface coatings are summarized. Elastomeric polyurethanes were found to best meet requirements. Two commercially available products, CAAPCO B-274 and Chemglaze M313, were subjected to further laboratory testing, airline service evaluations, and drag-measurement flight tests. It was found that these coatings were compatible with the severe operating environment of airlines and that coatings reduced airplane drag. An economic analysis indicated significant dollar benefits to airlines from application of the coatings. R.J.F.

N85-10936*# Douglas Aircraft Co., Inc., Long Beach, Calif.
RESULTS OF WINGLET DEVELOPMENT STUDIES FOR DC-10 DERIVATIVES Final Report
C. A. Shollenberger, J. W. Humphreys, F. S. Heiberger, and R. M. Pearson Washington NASA Mar. 1983 164 p refs
(Contract NAS1-15327)
(NASA-CR-3677; NAS 1.26:3677; ACEE-17-FR-1682) Avail: NTIS HC A08/MF A01 CSCL 01C

The results of investigations into the application of winglets to the DC-10 aircraft are presented. The DC-10 winglet configuration was developed and its cruise performance determined in a previous investigation. This study included high speed and low speed wind tunnel tests to evaluate aerodynamic characteristics, and a subsonic flutter wind tunnel test with accompanying analysis and evaluation of results. Additionally, a configuration integration study employed the results of the wind tunnel studies to determine the overall impact of the installation of winglets on the DC-10 aircraft. Conclusions derived from the high speed and low speed tests indicate that the winglets had no significant effects on the DC-10 stability characteristics or high speed buffet. It was determined that winglets had a minimal effect on aircraft lift characteristics and improved the low speed aircraft drag under high lift conditions. The winglets affected the DC-10 flutter characteristics by reducing the flutter speed of the basic critical mode and introducing a new critical mode involving outer wing torsion and longitudinal bending. The overall impact of winglets was determined to be of sufficient benefit to merit flight evaluation. Author

N85-10937# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION OF THE RUTAN AIRCRAFT FACTORY (RAF), INC. LONG-EZ AIRPLANE WITH EXTERNAL SIGHT Final Report, 12 Mar. - 10 Apr. 1984
D. L. Underwood, G. M. Yamakawa, T. L. Reynolds, and W. F. Carmona May 1984 108 p
(AD-A145381; USAAEFA-84-04) Avail: NTIS HC A06/MF A01 CSCL 01/3

The US Army Aviation Engineering Flight Activity conducted a Preliminary Airworthiness Evaluation of the LONG-EZ airplane with an external sensor (Combat Surveillance Airborne Test Bed (CSATB) configuration). During the test program 13 flights were conducted for a total of 15.3 hours, of which 11.6 were productive. The objectives of the evaluation were to assess the performance and handling qualities of the LONG-EZ so that the US Army Aviation systems Command could issue an airworthiness release to allow the 9th Infantry Division to conduct a mission evaluation of the CSATB configured aircraft. All tests were performed at an average gross weight of 1335 pounds and nominal mission longitudinal center of gravity (cg). Test results were compared with basic data obtained during previous testing and evaluated against military specification MIL-F-8785C. The performance was degraded considerably by the installation of the external sensor with handling qualities at the mid cg essentially identical to those obtained near the aft cg limit, FS 104.0, for the basic aircraft. The performance capabilities and handling qualities, however, are adequate for the CSATB evaluation including night operations. GRA

N85-10938# Federal Aviation Agency, Atlantic City, N.J.
QUASI-STEADY ANALYSIS OF AIRCRAFT PANEL FLAMMABILITY Final Report, Apr. 1983 - Apr. 1984
T. I. Eklund Jun. 1984 32 p
(AD-A145461; DOT/FAA/CT-84/14) Avail: NTIS HC A03/MF A01 CSCL 01/3

The purpose of this analysis is the development of a model that relates polymeric material properties to ignitability. The model is developed for an idealized fire test for ignitability of large-scale aircraft honeycomb panels in a vertical orientation. Transport relations for radiative heat transmission and turbulent mass and energy transfer are applied to an idealized piloted ignition of a vertical aircraft panel. The incident radiative energy required for panel ignition is related to thermal decomposition temperatures from thermogravimetric analysis. Effects of pyrolysis energy requirements and temperature dependence of flammability lean limits are incorporated in the analysis. The analysis is quasi-steady, in that transient effects are ignored and a slow ramp heating of the panel is assumed. State-of-the-art panel materials are dominated by radiative effects at the point of ignition. The analysis demonstrates that higher polymer degradation temperatures result in improved fireworthiness, that surface emissivities and reflectivities are the dominant factors controlling the incident radiation needed for ignition, and that the heat of pyrolysis becomes less significant in the energy balance as the polymer degradation temperature is raised. GRA

N85-10939# General Accounting Office, Washington, D. C. National Security and International Affairs Div.
PERFORMANCE CAPABILITIES OF THE C-5 AND C-17 CARGO AIRCRAFT
9 Jul. 1984 21 p
(AD-A145518; GAO/NSIAD-84-119) Avail: NTIS HC A02/MF A01 CSCL 01/3

This report discusses Air Force and contractor information on the feasibility of using the C-5A/B and C-17 cargo aircraft in small, austere airfield operations. It also discusses other general characteristics and performance capabilities of both aircraft. Although the manufacturer disagrees, the Air Force, based on its 13 years of C-5A experience, believes that neither the C-5A nor the C-5B can routinely and safely land or takeoff from small, austere airfields. The Air Force further advised us that the C-5A/B is not suited for small airfield ground operations because of its large size and lack of maneuverability. For these reasons, the Air Force states it will continue to restrict routine operations C-17 advantages in the small, austere airfield environment include its smaller size, better maneuverability using its backup capability, and its combat offload capability. The Military Airlift Command states that the C-17 will be able to perform any type of mission currently assigned to the Command, including tactical airlift missions currently performed by the C-130. GRA

N85-10940# Lufthansa G.m.b.H., Hamburg (West Germany).
INSIGHT. BACKGROUND INFORMATION FOR MULTIPURPOSE PILOTS: FLIGHT PHENOMENA [INSIGHT. HINTERGRUND-INFORMATIONEN FUER VIELFLIEGER]
1984 23 p In GERMAN Original contains color illustrations
Avail: NTIS HC A02/MF A01

A flight between Frankfurt and Cairo aboard an Airbus 310 is described. Takeoff, cruise, approach, landing, and braking procedures are summarized and a brief description of the cockpit is included. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-10941# Battelle Columbus Labs., Ohio.
AVIONICS INTEGRITY PROGRAM (AVIP). VOLUME 4: FORCE

MANAGEMENT. ECONOMIC LIFE CONSIDERATIONS Final Report, Sep. 1983 - Mar. 1984
M. Bridgman, S. R. McInerney, and D. Eldridge Mar. 1984 40 p
(Contract F33657-83-C-0229)
(AD-A145592; ASD-TR-84-5012) Avail: NTIS HC A03/MF A01 CSCL 01/3

The study assesses the qualities that defined the economic life of avionic hardware. Economic life is the term often used to refer to the period of time during which financial consideration justify the continued use of an existing system. The study addresses the strategies of logistic support. Terminology of the development of one economic life model computer program is included in the appendix. It is incomplete. It provides a baseline for future work for evaluating the timeframe limits for determining whether continued use of or replacement of a existing system would be more cost effective. Originator assigned keywords include: Life cycle cost; Stockpiling of components; Technological obsolescence; Economic life modeling parameters; and Cost effective.
GRA

N85-10942# Gould, Inc., El Monte, Calif. Navcom Systems Div.
AVIONICS INTEGRITY PROGRAM (AVIP). VOLUME 3: PROGRAM COST ASSESSMENT - ENVIRONMENTAL STRESS SCREENING AND DIAGNOSTIC TECHNIQUES Final Report, Sep. 1983 - Mar. 1984
J. L. Capitano and D. Eldridge, ed. (Battelle Memorial Inst., Columbus, Ohio) Mar. 1984 56 p Revised
(Contract F33657-83-C-0229)
(AD-A145644; ASD-TR-84-5009) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report covers Gould Inc.'s methodology of work with respect to Environmental Stress Screening (ESS) and represents an approach that can be demonstrated to result in increased integrity in the fielded product. It addresses the use of ESS as a concept whose effectiveness is achieved by exposing product to environments harsher than experienced in the field while not shortening its life. The pitfalls of the present procurement philosophy are exposed with major revisions recommended including that some of the funding that is currently in logistics support be spent as part of the initial contract budget to cause these failures to be removed. The total system savings to the Government by accepting a new method of work such as Environmental Stress Screening to reduce a logistics support budget are discussed. Additional topics discussed include: Latent defect removal, Failure diagnosis, Design-for-forgiveness, Quality feedback, Vendor control, Part screens, Corrective action, Combined environmental reliability testing (CERT), and Cost tradeoffs.
GRA

N85-10943# Battelle Columbus Labs., Ohio.
AVIONICS INTEGRITY PROGRAM (AVIP). VOLUME 1: PROCUREMENT PHASE ISSUES: DESIGN, MANUFACTURING, AND INTEGRATION Final Report, Sep. 1983 - Mar. 1984
D. Eldridge, E. F. Hitt, R. K. Thatcher, and L. D. Scurlock Mar. 1984 229 p
(Contract F33657-83-C-0229)
(AD-A145651; ASD-TR-84-5010-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 05/1

This report addresses program phases of design, manufacturing and integration. It includes assessments of methodologies of work which can be used to develop a proven, tolerant product capable of withstanding the use environment. The goal of the process described is to eliminate defective piece parts, processes and final product, prior to delivery to the purchasing activity. A tolerable systems engineering process, dealing with activities that are known to take place during each phase can be developed through use of the material provided. GRA

N85-10944# Battelle Columbus Labs., Ohio.
AVIONICS INTEGRITY PROGRAM (AVIP). VOLUME 2: HARDWARE CASE STUDIES Final Report, Sep. 1983 - Mar. 1984
E. F. Hitt and D. Eldridge Mar. 1984 27 p 4 Vol.
(Contract F33657-83-C-0229)
(AD-A145689; ASD-TR-84-5011) Avail: NTIS HC A03/MF A01 CSCL 05/1

The report presents a review of the efforts that several avionic manufacturers and systems integrators are using to eliminate defective parts and processes in hardware prior to delivery to a procuring activity. Time phasing for the major efforts vary among manufacturers depending on what is perceived to be best within their own realm of manufacturing operations. The resultant data identified areas of concern especially: (1) feedback from the field on the nature and types of errors that are being encountered, (2) the utility of built-in-test/fault-isolation-test, and (3) the specific nature and utilization of test equipment and establishment of data base information obtained from the test equipment. The case studies should be expanded to include data from the various users as well as from the base or depot level repair stations. The data from these organizations, if properly used, could improve the integrity of the product, especially for the next generation avionics systems.
GRA

N85-10945# General Accounting Office, Washington, D. C. National Security and International Affairs Div.
INCREASED JOINT AVIONICS STANDARDIZATION COULD RESULT IN MAJOR ECONOMIES AND OPERATIONAL BENEFITS
10 Jul. 1984 32 p
(AD-A145730; AD-F300467; GAO/NSIAD-84-127) Avail: NTIS HC A03/MF A01 CSCL 01/4

This report discusses the Department of Defense's efforts to standardize tactical avionics subsystems and the need to provide better support for these activities. The objective was to look at the progress made in standardizing core avionics subsystems by the Joint Services Review Committee for Avionics Components and Subsystems. Top management commitment must be enhanced and funds must be allocated to projects expected to provide major cost-saving and operational benefits. The GAO recommends to: establish a management structure for standardization that includes a high-level sponsor accountable for supporting the JSRC programs through the budget process, determine whether funds for fiscal year 1984 and subsequent years should be reprogrammed to ensure that joint standard avionics systems sponsored by JSRC are developed and available when needed to meet candidate aircraft installation schedules, and establish a dedicated budget line item for joint avionics programs. The DOD agrees with the first two recommendations but does not agree with the last one.
GRA

N85-10946# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
THE DE TIFINI STAR POINTER CHARACTERIZATION AND CONCLUSIONS ON THE 1982 TRANSMEDITERRANEAN FLIGHT [CARACTERISATION DU POINTEUR STELLAIRE DE TIFANI ET CONCLUSIONS SUR LE VOL TRANSMEDITERRANEE 1982]
C. Peyron Jan. 1983 35 p refs In FRENCH
(CESR-83-1070) Avail: NTIS HC A03/MF A01

Variations in the background luminosity measured by a star pointer during a transmeditarrenean balloon flight were studied. The measured background-signal increases to three times the original value. Flight results show a ratio of 2.5 between system saturation level and the background luminosity. Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-10947*# United Technologies Corp., East Hartford, Conn. Engineering Div.
ENERGY EFFICIENT ENGINE FLIGHT PROPULSION SYSTEM PRELIMINARY ANALYSIS AND DESIGN REPORT Final Update Report
J. W. Bisset and D. C. Howe Sep. 1983 166 p refs
(Contract NAS3-20646)
(NASA-CR-174701; NAS 1.26:174701; PWA-5594-248) Avail: NTIS HC A08/MF A01 CSCL 21E

The final design and analysis of the flight propulsion system is presented. This system is the conceptual study engine defined to meet the performance, economic and environmental goals established for the Energy Efficient Engine Program. The design effort included a final definition of the engine, major components, internal subsystems, and nacelle. Various analytical representations and results from component technology programs are used to verify aerodynamic and structural design concepts and to predict performance. Specific design goals and specifications, reflecting future commercial aircraft propulsion system requirements for the mid-1980's, are detailed by NASA and used as guidelines during engine definition. Information is also included which details salient results from a separate study to define a turbofan propulsion system, known as the maximum efficiency engine, which re-optimized the advanced fuel saving technologies for improved fuel economy and direct operating costs relative to the flight propulsion system. M.A.C.

N85-10948*# Washington Univ., Seattle.
AN INTERACTIVE COMPUTER CODE FOR CALCULATION OF GAS-PHASE CHEMICAL EQUILIBRIUM (EQLBRM) Final Report
Brian S. Pratt and David T. Pratt Oct. 1984 22 p refs
(Grant NAG3-277)
(NASA-CR-168337; NAS 1.26:168337) Avail: NTIS HC A02/MF A01 CSCL 21E

A user friendly, menu driven, interactive computer program known as EQLBRM which calculates the adiabatic equilibrium temperature and product composition resulting from the combustion of hydrocarbon fuels with air, at specified constant pressure and enthalpy is discussed. The program is developed primarily as an instructional tool to be run on small computers to allow the user to economically and efficiency explore the effects of varying fuel type, air/fuel ratio, inlet air and/or fuel temperature, and operating pressure on the performance of continuous combustion devices such as gas turbine combustors, Stirling engine burners, and power generation furnaces. M.A.C.

N85-10949*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACCELERATED CONVERGENCE FOR INCOMPRESSIBLE FLOW CALCULATIONS
Geralyn M. Neely and Russell W. Claus [1984] 13 p refs Proposed for presentation at the 23rd Aerospace Sci. Meeting, Reno, Nev., 14-17 Jan. 1985; sponsored by the American Inst. of Aeronautics and Astronautics
(NASA-TM-86863; E-2327; NAS 1.15:86863) Avail: NTIS HC A02/MF A01 CSCL 21E

Two improved algorithms which solve the steady-state Navier-Stokes equations, PISO and SIMPLER, are studied. Computations were carried out on progressively finer grids for the driven cavity and flow over a backward-facing step. The effects of relaxation factor, number of grid nodes and number of sweeps through the pressure equations are studied to evaluate the performance of the PISO and SIMPLER schemes. Results show that these improved schemes accelerate the convergence rate of the solution generally by a factor of two as compared to the SIMPLE method. Author

N85-10950*# United Technologies Corp., East Hartford, Conn.
ENERGY EFFICIENT ENGINE COMBUSTOR TEST HARDWARE DETAILED DESIGN REPORT
M. H. Zeisser, W. Greene, and D. J. Dubiel Mar. 1982 105 p refs
(Contract NAS3-20646)
(NASA-CR-167945; NAS 1.26:167945; PWA-5594-197) Avail: NTIS HC A06/MF A01 CSCL 21E

The combustor for the Energy Efficient Engine is an annular, two-zone component. As designed, it either meets or exceeds all program goals for performance, safety, durability, and emissions, with the exception of oxides of nitrogen. When compared to the configuration investigated under the NASA-sponsored Experimental Clean Combustor Program, which was used as a basis for design, the Energy Efficient Engine combustor component has several technology advancements. The prediffuser section is designed with short, strutless, curved-walls to provide a uniform inlet airflow profile. Emissions control is achieved by a two-zone combustor that utilizes two types of fuel injectors to improve fuel atomization for more complete combustion. The combustor liners are a segmented configuration to meet the durability requirements at the high combustor operating pressures and temperatures. Liner cooling is accomplished with a counter-parallel FINWALL technique, which provides more effective heat transfer with less coolant. Author

N85-10951*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE ENGINE HOT SECTION TECHNOLOGY (HOST)
Washington Oct. 1982 356 p refs Workshop held in Cleveland, 19-20 Oct. 1982
(NASA-TM-83022; E-1458; NAS 1.15:83022) Avail: NTIS HC A16/MF A01 CSCL 21E

Research and plans concerning aircraft gas turbine engine hot section durability problems were discussed. Under the topics of structural analysis, fatigue and fracture, surface protective coatings, combustion, turbine heat transfer, and instrumentation specific points addressed were the thermal and fluid environment around liners, blades, and vanes, material coatings, constitutive behavior, stress-strain response, and life prediction methods for the three components. For individual titles, see N85-10952 through N85-10988.

N85-10952*# General Electric Co., Cincinnati, Ohio.
EQUIVALENT DAMAGE: A CRITICAL ASSESSMENT
J. H. Laflen and T. S. Cook *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 11-23 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The overall goal of achieving improved life cycle management of aircraft engine, gas turbine components is a major industry thrust. Low cycle fatigue (LCF) crack initiation prediction, an important element of life cycle management as traditionally applied, may be overly conservative in estimating total cyclic life capability. Consequently, there is increasing pressure to improve predictive methods both for crack initiation and for subsequent crack propagation. The utility of equivalent damage concepts for application to hot section components of aircraft engines was studied. Specifically, the topics examined were mean stress, cumulative damage, and multiaxiality. Other factors inherently linked to this study were the basic formulation of damage parameters at elevated temperatures and the fact that hot section components experience severe temperature fluctuations throughout their service lifetime. R.S.F.

N85-10953*# General Electric Co., Cincinnati, Ohio.
BENCHMARK NOTCH TEST FOR LIFE PREDICTION

P. A. Domas, J. Yau, W. N. Sharpe (Louisiana State Univ., Baton Rouge), and M. Ward (Louisiana State Univ., Baton Rouge) *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 25-37 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Aircraft gas turbine engine components are subjected to severe stress, temperature, and environmental conditions. Economic and reliabilty demands have prompted inordinate effort in development of analytic methods to predict stresses and strains in aircraft engines. There remains, however, the need to check or verify these analytical methodologies against actual experimental data measurements. The laser interferometric strain displacement gage was recognized as having the potential to accomplish this task and was employed in this program. The actual strains incurred at the root of a discontinuity in cyclically loaded test samples subjected to inelastic deformation at high temperature where creep deformation readily occur were measured. The steady-state, cyclic stress-strain response at the root of the discontinuity in the tested samples was analyzed for comparison with the measured results. A comprehensive set of local notch root strain measurements for a variety of load patterns in an Inconel 718 notch specimen at 649 C (1200 F) was obtained and documented using the laser interferometric strain displacement gage. R.S.F.

N85-10954*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR STRUCTURAL AND LIFE ANALYSES OF A TURBINE BLADE
Albert Kaufman *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 39-44 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The most critical structural requirements that aircraft gas turbine engines must meet result from the diversity of extreme environmental conditions in the turbine section components. Accurate life assessment of the components under these conditions requires sound analytical tools and techniques. The utility of advanced structural analysis techniques and advanced life prediction techniques in the life assessment of hot-section components was evaluated. The extend to which a three-dimensional cyclic isoparametric finite element analysis of a hot-section component would improve the accuracy of component life predictions was assessed. At the same time, high temperature life prediction theories such as strainrange partitioning and the frequency modified approaches were applied and their efficiency judged. A stress analysis was performed on a commercial air-cooled turbine blade. The evaluation of the life prediction methods indicated that none of those studied were satisfactory. R.S.F.

N85-10955*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR STRUCTURAL AND LIFE ANALYSES OF A COMBUSTOR LINER
Albert Kaufman *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 45-53 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Three-dimensional, nonlinear, finite element structural analyses were performed for a simulated aircraft combustor liner specimen in order to assess the capability of nonlinear analyses using classical inelastic material models to represent the thermoplastic-creep response of the component. In addition, the computed stress-strain history at the critical location was input into life prediction methods in order to evaluate the ability of these procedures to predict crack initiation life. It is concluded that: (1) elastic analysis is adequate for obtaining strain range and critical location; (2) inelastic analyses did not accurately represent cyclic behavior of materials; and (3) none of the crack initiation life prediction methods were satisfactory. R.S.F.

N85-10956*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRE-HOST HIGH TEMPERATURE CRACK PROPAGATION
Thomas W. Orange *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 55-63 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The highlights of NASA contract CR-167896, Fracture Mechanics Criteria for Turbine Engine Hot Section Components, are presented. The five technical tasks of the program are reviewed. Results of several tasks are presented. R.S.F.

N85-10957*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOST INSTRUMENTATION R AND D PROGRAM OVERVIEW
Norman C. Wenger *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 65-68 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The turbine hot-section technology (HOST) Instrumentation R&D program focuses on two main classes of instrumentation: (1) those that characterizes the environment around the turbine engine components, which include gas flows measurement, gas temperatures, and heat fluxes; (2) to characterize the effect of the environment on the turbine engine components, which include strain measurements and an optical system to structural responses such as cracking, buckling, spalling, carbon buildup. The HOST Instrumentation R&D program concentrates on the critical measurements that can not be made by commercially available instruments or with instruments that are already in development. The measurements of strain and gas flow are emphasized, these measurements are extremely critical to the success of the HOST program and the HOST requirements differ from the current state of the art by a considerable margin. E.A.K.

N85-10958*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
DYNAMIC GAS TEMPERATURE MEASUREMENT SYSTEM
Dennis Elmore *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 75-82 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The development of an advanced measuring system which measures the rapidly varying gas temperature at the exit of an aircraft jet engine combustor during ground based testing of hot section components was identified. Sensor guidelines, technical approach/program schedule, and the accomplishments are reviewed. The environment of a present generation combustor is shown. The method uses two beadless junctions type-B thermocouples to measure heat transfer coefficient in situ. Heat conduction effects are shown by a finite element model of the thermocouple. Author

N85-10959*# United Technologies Research Center, East Hartford, Conn.
HIGH TEMPERATURE STATIC STRAIN SENSOR DEVELOPMENT PROGRAM
Charles Hulse, Frank Lemkey, Richard Bailey, and Howard Grant *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 83-91 (For primary document see N85-10951 02-07)
(Contract NAS3-23169)
Avail: NTIS HC A16/MF A01 CSCL 21E

The development of resistance strain gages which are useful for static strain measurements on nickel or cobalt superalloy parts inside a gas turbine engine on a test stand were examined. These measurements of a strain gage alloy development program which to be followed by an optional investigation of complete strain gage systems which will use the best of the alloys developed together with other system improvements is reviewed. The specific goal for the complete system is to make measurements to 2,000 micro epsilon with error of only + or - 10% over a 50 hour period. In addition to simple survival and stability, attaining a low thermal coefficient to resistivity, of order 100 ppm/K or less, is also a major goal. The first task was to select candidate alloys or alloy systems using a search of the literature and the available metallurgical theory. Alloy candidates were evaluated and compared by a grading system. Equipment and techniques were developed which are suitable for iterative studies of a variety of

compositions. Many compositions were examined and significantly improved alloys were identified. E.A.K.

N85-10960*# United Technologies Research Center, East Hartford, Conn.
LASER SPECKLE TECHNIQUE FOR BURNER LINER STRAIN MEASUREMENTS
Karl A. Stetson *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 93-99 refs (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Thermal and mechanical strains were measured on samples of a common material used in jet engine burner liners, which were heated from room temperature to 870 C and cooled back to 220 C, in a laboratory furnance. The physical geometry of the sample surface was recorded at selected temperatures by a set of 12 single exposure speckle-grams. Sequential pairs of speckle-grams were compared in a heterodyne interferometer which give high precision measurement of differential displacements. Good speckle correlation between the first and last specklegrams is noted which allows a check on accumulate errors. E.A.K.

N85-10961*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Commercial Engineering.
HEAT FLUX SENSORS FOR BURNER LINERS AND TURBINE BLADES AND VANES
W. G. Alwang *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 101-108 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The technology of heat flux measurement is addressed. The development of total heat flux sensors for burner liners and also the demonstration of total and radiant heat flux sensors in a combustor test is covered. A thorough review of potential approaches is conducted including both transient and steady state measurements. Measurement of total heat flux was emphasized, consequently configurations are sought which produce minimum disturbance to the heat flux which would be present without the sensor in place. Approaches to the turbine blade and vane heat flux sensor program are discussed. E.R.

N85-10962*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOT SECTION LASER ANEMOMETRY
William C. Nieberding *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 109-112 ref (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The objectives and problems faced in the development of a laser anemometry system for hot section applications was discussed. The goal was to map the flow profiles through and between the vanes and between the rotating blades of a turbine. A laser anemometer system was developed which measures the Doppler shift directly along the optical axis. Some testing is being conducted in a small bench top combustor facility. The cost involved in this testing was also discussed. E.R.

N85-10963*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
LASER ANEMOMETER OPTIMIZATION
Robert V. Edwards *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 113-118 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The design, construction, and testing of laser anemometer configurations for hot section velocity measurements is discussed. The optimization of the laser anemometer systems include the data processing algorithms used. Some relevant hot section properties considered are high temperature with a large background radiation, difficulty of optical access, large flow velocity variations, the presence of solid surfaces that generate reflections and low seed particle density. E.R.

N85-10964*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE HEAT TRANSFER
John E. Rohde *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 119-136 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Objectives and approaches to research in turbine heat transfer are discussed. Generally, improvements in the method of determining the hot gas flow through the turbine passage is one area of concern, as is the cooling air flow inside the airfoil, and the methods of predicting the heat transfer rates on the hot gas side and on the coolant side of the airfoil. More specific areas of research are: (1) local hot gas recovery temperatures along the airfoil surfaces; (2) local airfoil wall temperature; (3) local hot gas side heat transfer coefficients on the airfoil surfaces; (4) local coolant side heat transfer coefficients inside the airfoils; (5) local hot gas flow velocities and secondary flows at real engine conditions; and (6) local delta strain range of the airfoil walls. E.R.

N85-10965*# Detroit Diesel Allison, Indianapolis, Ind.
GAS SIDE HEAT TRANSFER: 2-D FLOW
Ronald York *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 137-147 refs (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Significant progress was made in advancing the idea of establishing a unified approach for predicting airfoil heat transfer for a wide range of operating conditions and geometries. Preliminary results are encouraging and further mixing length (ml) turbulence modeling ideas will be explored, concentrating on transition behavior. The capability of available modeling techniques to predict airfoil surface heat transfer distributions in a two-dimensional flow field was assessed, experimental data as required for model verification were acquired, and improvements in the analytic models was made and verified. B.G.

N85-10966*# Tennessee Univ. Space Inst., Tullahoma.
GAS FLOW ENVIRONMENT AND HEAT TRANSFER NON-ROTATING 3D PROGRAM
Roy J. Schulz *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 149-159 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

A complete set of benchmark quality data for the flow and heat transfer within a large rectangular turning duct is provided. These data are to be used to evaluate, and verify, three-dimensional internal viscous flow models and computational codes. The analytical contract objective is to select a computational code and define the capabilities of this code to predict the experimental results obtained. Details of the proper code operation will be defined and improvements to the code modeling capabilities will be formulated. Internal flow in a large rectangular cross-sectioned 90 deg. bend turning duct was studied. The duct construction was designed to allow detailed measurements to be made for the following three duct wall conditions: (1) an isothermal wall with isothermal flow; (2) an adiabatic wall with convective heat transfer by mixing between an unheated surrounding flow; and (3) an isothermal wall with heat transfer from a uniformly hot inlet flow. B.G.

N85-10967*# Arizona State Univ., Tempe. Dept. of Mechanical and Aerospace Engineering.
JET ARRAY IMPINGEMENT FLOW DISTRIBUTIONS AND HEAT TRANSFER CHARACTERISTICS: EFFECTS OF INITIAL CROSSFLOW AND NONUNIFORM ARRAY GEOMETRY
L. W. Florschuetz and D. E. Metzger *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 161-173 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Flow distributions and heat transfer characteristics for two-dimensional arrays of circular air jets impinging on a surface parallel to the jet orifice plate were determined. The configurations

considered were intended to model those of interest in current and contemplated gas turbine airfoil midchord cooling applications. The geometry of the airfoil applications considered dictates that all of the jet flow, after impingement, exit in the chordwise (i.e., streamwise) direction toward the trailing edge. Experimental results for the effect of an initial crossflow on both flow distributions and heat transfer characteristics for a number of the prior uniform array geometries. The effects of nonuniform array geometries on flow distributions and heat transfer characteristics for noninitial crossflow configurations are discussed. B.G.

N85-10968*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COOLANT PASSAGE HEAT TRANSFER WITH ROTATION
John E. Rohde *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 175-179 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Although the effects of the coriolis and buoyancy forces due to rotation on coolant-side heat transfer are generally not included in the design methods for blades, the influence of these forces could be large. Comparisons of nonrotating heat transfer data and extrapolations of available correlation for the average heat transfer coefficients with radial outflow of cooling air showed that neglecting rotation at gas turbine engine conditions result in variations in the heat transfer coefficient by as much as 45 percent. This, in effect, results in blade metal temperatures running as much as 100 F different from predicted values. This also may explain why rotating blade metal temperatures in engine tests are often higher than expected from results obtained in nonrotating cascade tests. B.G.

N85-10969*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURAL ANALYSIS
Robert H. Johns *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 181-184 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Hot section components of aircraft gas turbine engines are subjected to severe thermal-structural loading conditions, especially during the start-up and take-off portions of the engine cycle. The most severe and damaging stresses and strains are those induced by the steep thermal gradients induced during the start-up transient. These transient stresses and strains are also the most difficult to predict, in part because the temperature gradients and distributions are not well known or predictable, and also because the cyclic elasto-viscoplastic behavior of the materials at these extremes of temperature and strain are not well known or predictable. One element of the structures program will develop improved time-varying thermal-mechanical load models for the entire engine mission cycle from start-up to shutdown. The thermal model refinements will be consistent with those required by the structural code including considerations of mesh-point density, strain concentrations, and thermal gradients. Models will be developed for the burner liner, turbine vane and turbine blade. B.G.

N85-10970*# General Electric Co., Cincinnati, Ohio. Aircraft Engineering Business Group.
BURNER LINER THERMAL/STRUCTURAL LOAD MODELLING
R. J. Maffeo *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 185-196 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The objective of this program is to develop a thermal data transfer computer program module for the Burner Liner Thermal-Structural Load Modelling Program. This will be accomplished by reviewing existing methodologies for thermal data transfer and selecting three heat transfer codes for application in this program, evaluating the selected codes to establish criteria for developing a computer program module to transfer thermal data from the heat transfer codes to selected stress analysis codes, developing the automated thermal load transfer module, and verifying and documenting the module. The overall objectives of this thermal transfer module are that it handle independent mesh configurations, perform the transfer in an accurate and efficient fashion and that the total system be flexible for future improvements. R.J.F.

N85-10971*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPONENT-SPECIFIC MODELING
Murray S. Hirschbein *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 197-202 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The ability to accurately structurally analyze engine components to assure that they can survive for their designed lifetime in an increasingly harsh environment is discussed. Under the HOST (HOt Section Technology) program, advanced component-specific modeling methods, with built-in analysis capability, will be developed separately for burner liners, turbine blades and vanes. These modeling methods will make maximum use of, but will not rely solely on, existing analysis methods and techniques, to analyze the three identified components. Nor will the complete structural analysis of a component necessarily be performed as a single analysis. The approach to be taken will develop complete software analysis packages with internal, component-specific, self-adaptive solution strategies. Each package will contain a set of modeling and analysis tools. The selection and order of specific methods and techniques within the set to be applied will depend on the specific-component, the current thermo-mechanical loading, and the current state of the component. All modeling and analysis decisions will be made internally based on developed decision criteria within the solution strategies; minimal user intervention will be required. B.W.

N85-10972*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE 3-D INELASTIC ANALYSIS METHODS FOR HOT SECTION COMPONENTS: BRIEF DESCRIPTION
Christos C. Chamis *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 203-208 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01

Advanced 3-D inelastic structural/stress analysis methods and solution strategies for more accurate yet more cost-effective analysis of components subjected to severe thermal gradients and loads in the presence of mechanical loads, with steep stress and strain gradients are being developed. Anisotropy, time and temperature dependent plasticity and creep effects are also addressed. The approach is to develop four different theories, one linear and three higher order theories (polynomial function, special function, general function). The theories are progressively more complex from linear to general function in order to provide streamlined analysis capability with increasing accuracy for each hot section component and for different parts of the same component according to the severity of the local stress, strain and temperature gradients associated with hot spots, cooling holes and surface coating cracks. To further enhance the computational effectiveness, the higher order theories will have embedded singularities (cooling passages, for example) in the generic modeling region. Each of the four theories consists of three formulation models derivable from independent theoretical formulations. These formulation models are based on: (1) mechanics of materials; (2) special finite elements; and (3) an advanced formulation to be recommended by the contractor. B.W.

N85-10973*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIFE PREDICTION AND CONSTITUTIVE BEHAVIOR: OVERVIEW
Gary R. Halford *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 209-212 (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

The evolution of programs to investigate high temperature consititutive behavior and develop cyclic life prediction methods is reviewed. Contracts granted for developing and verifying workable engineering methods for the calculation, in advance of service, of the local stress-strain response at the critical life governing location in typical hot section components as well as the resultant cyclic crack initiation and crack growth lifetimes are listed. The Langley fatigue facility is being upgraded to include: (1) a servocontrolled testing machine for high temperature crack growth; (2) three servocontrolled tension/torsion machines for biaxial studies; (3) a HOST/satellite computer for data acquisition, processing, storage, and retrieval; and (4) HCV/LCF machines for cumulative damage studies. A.R.H.

N85-10974*# Pratt and Whitney Aircraft, East Hartford, Conn. Commercial Engineering.

CREEP-FATIGUE LIFE PREDICTION FOR ENGINE HOT SECTION MATERIALS (ISOTROPIC)

Vito Moreno *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 213-214 (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

The objectives of this program are the investigation of fundamental approaches to high temperature crack initiation life prediction, identification of specific modeling strategies and the development of specific models for component relevant loading conditions. A survey of the hot section material/coating systems used throughout the gas turbine industry is included. Two material/coating systems will be identified for the program. The material/coating system designated as the base system shall be used throughout Tasks 1-12. The alternate material/coating system will be used only in Task 12 for further evaluation of the models developed on the base material. In Task II, candidate life prediction approaches will be screened based on a set of criteria that includes experience of the approaches within the literature, correlation with isothermal data generated on the base material, and judgements relative to the applicability of the approach for the complex cycles to be considered in the option program. The two most promising approaches will be identified. Task 3 further evaluates the best approach using additional base material fatigue testing including verification tests. Task 4 consists of technical, schedular, financial and all other reporting requirements in accordance with the Reports of Work clause. R.J.F.

N85-10975*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CONSTITUTIVE MODEL DEVELOPMENT FOR ISOTROPIC MATERIALS

Albert Kaufman *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 215-221 (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

The objective is to develop a unified constitutive model for finite-element structural analysis of turbine engine hot section components. This effort constitutes a different approach for nonlinear finite-element computer codes which were heretofore based on classical inelastic methods. A unified constitutive theory will avoid the simplifying assumptions of classical theory and should more accurately represent the behavior of superalloy materials under cyclic loading conditions and high temperature environments. Model development will be directed toward isotropic, cast nickel-base alloys used for aircooled turbine blades and vanes. The contractor will select a base material for model development and an alternate material for verification purposes from a list of three alloys specified by NASA. The candidate alloys represent a cross-section of turbine blade and vane materials of interest to both large and small size engine manufacturers. Material stock for the base and alternate materials will be supplied to the Contractor by the government. R.J.F.

N85-10976*# Army Research and Technology Labs., Cleveland, Ohio. Propulsion Lab.

LIFE PREDICTION AND CONSTITUTIVE MODELS FOR ANISOTROPIC MATERIALS

Robert C. Bill *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 223-226 (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

The intent of this program is to develop a basic understanding of cyclic creep-fatigue deformation mechanisms and damage accumulation, a capability for reliable life prediction, and the ability to model the constitutive behavior of anisotropic single crystal (SC) and directionally solidified or recrystallized (DSR) comprise the program, and the work breakdown for each option reflects a distinct concern for two classes of anisotropic materials, SC and DSR materials, at temperatures encountered in the primary gas path (airfoil temperatures), and at temperatures typical of the blade root attachment and shank area. Work directed toward the higher temperature area of concern in the primary gas path includes effects of coatings on the behavior and properties of the materials of interest. The blade root attachment work areas will address the effects of stress concentrations associated with attachment features. R.J.F.

N85-10977*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HOST HIGH TEMPERATURE CRACK PROPAGATION

Thomas W. Orange *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 227-229 (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

Methods for characterizing and predicting crack growth at elevated temperatures are discussed. Nonlinear behavior, thermal gradients, and thermomechanical cycling are discussed. R.J.F.

N85-10978*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURFACE PROTECTION OVERVIEW

Stanley R. Levine *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 231-239 (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

A first-cut integrated environmental attack life prediction methodology for hot section components is addressed. The HOST program is concerned with oxidation and hot corrosion attack of metallic coatings as well as their degradation by interdiffusion with the substrate. The effects of the environment and coatings on creep/fatigue behavior are being addressed through a joint effort with the Fatigue sub-project. An initial effort will attempt to scope the problem of thermal barrier coating life prediction. Verification of models will be carried out through benchmark rig tests including a 4 atm. replaceable blade turbine and a 50 atm. pressurized burner rig. B.W.

N85-10979*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AIRFOIL DEPOSITION MODEL

Fred J. Kohl *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 241-257 refs (For primary document see N85-10951 02-07)

Avail: NTIS HC A16/MF A01 CSCL 21E

The methodology to predict deposit evolution (deposition rate and subsequent flow of liquid deposits) as a function of fuel and air impurity content and relevant aerodynamic parameters for turbine airfoils is developed in this research. The spectrum of deposition conditions encountered in gas turbine operations includes the mechanisms of vapor deposition, small particle deposition with thermophoresis, and larger particle deposition with inertial effects. The focus is on using a simplified version of the comprehensive multicomponent vapor diffusion formalism to make deposition predictions for: (1) simple geometry collectors; and (2) gas turbine blade shapes, including both developing laminar and turbulent boundary layers. For the gas turbine blade the insights developed in previous programs are being combined with heat and mass transfer coefficient calculations using the STAN 5

boundary layer code to predict vapor deposition rates and corresponding liquid layer thicknesses on turbine blades. A computer program is being written which utilizes the local values of the calculated deposition rate and skin friction to calculate the increment in liquid condensate layer growth along a collector surface. B.W.

N85-10980*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF SURFACE CHEMISTRY ON HOT CORROSION LIFE: OVERVIEW
John Merutka *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 263-267 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

This program concentrates on analyzing a limited number of hot corroded components from the field and the carrying out of a series of controlled laboratory experiments to establish the effects of oxide scale and coating chemistry on hot corrosion life. This is to be determined principally from the length of the incubation period, the investigation of the mechanisms of hot corrosion attack, and the fitting of the data generated from the test exposure experiments to an empirical life prediction model. Author

N85-10981*# Army Research and Technology Labs., Cleveland, Ohio. Propulsion Lab.
COMBUSTION HOT SECTION TECHNOLOGY
David B. Ercegovic *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 269-281 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The Turbine Engine Hot Section Technology Combustion Program is briefly described. The overall objective of the project is to develop and verify improved and more accurate analysis methods for increasing the ability to design with confidence the combustion system for advanced aircraft turbine engines. The approach is to first assess and evaluate existing combustor aerothermal analysis models by means of a contracted effort initiated during FY-82. The program also includes both analytical and experimental research efforts in the areas of aerothermal modeling and liner cyclic life. It is expected that the combustor model development effort will generate improved understanding in the areas of high pressure flame radiation characteristics, model numerical methods and solution schemes, complex geometrical boundary conditions, fuel spray - flow field interactions, combustion kinetics, flow and mixing of dilution jets, turbulence and heat transfer, and soot and carbon formation. M.G.

N85-10982*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Engineering.
AEROTHERMAL MODELING
G. J. Sturgess *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 283-299 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The objectives, approach, and status of a program to develop the computational fluid dynamics tools needed to improve combustor design and analysis are outlined. The calculation procedure selected consists of a finite difference solution of the time averaged, steady state, primitive variable, elliptic form of the Reynolds equations. Standard TEACH type numerics are used to solve the resulting equations. These include hybrid differencing, SIMPLE algorithm for the pressure field, line by line iterative solution using the ADI method and the tridiagonal matrix algorithm (TDMA). Convergence is facilitated by using under relaxation. The physical processes are modeled by a two equation eddy viscosity model for turbulence; combustion is represented by a simple, irreversible, one step chemical reaction whose rate is influenced only by the time scale of the turbulence. The model evaluation procedure is also described. M.G.

N85-10983*# General Electric Co., Evendale, Ohio.
AEROTHERMAL MODELING PROGRAM
Milton Kenworthy *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 301-306 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Some significant features of the approach adopted for the combustor aerothermal modeling program are described. The individual computerized models utilized in the aero design approach are characterized. The preliminary design module provides the overall envelope definition of the burner. The diffuser module provides the detailed contours of the diffuser and combustor cowl region, as well as the pressure loss characteristics into each of the individual flow passages into the dome and around the combustor. The flow distribution module provides the air entry quantities through each of the aperatures and the overall pressure drop. The heat transfer module provides detailed metal temperature distribution throughout the metal structure as input to stress and life analysis that are not part of the aerothermo design effort. Finally, the internal flow module, INTFLOW, is described and the approach for model evaluation using laboratory data is discussed. M.G.

N85-10984*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DILUTION ZONE MIXING STUDIES
J. D. Holdeman *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 307-314 refs (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

The objectives and status of a project to investigate various aspects of the jet in a confined cross flow problem are outlined. The experiments performed thus far dealt primarily with a single row of jets mixing into an isothermal flow in a constant cross section duct. Variations in the mixing were observed as a function of jet to mainstream momentum ratio, orifice size, and spacing. The current experiments examine perturbations of this problem characteristic to gas turbine combustion chambers, namely: flow area convergence, nonisothermal mainstream flow, and opposed in line and staggered injection. An empirical model was developed to describe the observed temperature distributions. The current interactive code provides a 3-D pictorial representation of the temperature, as given by these correlations, for any user specified downstream location, flow, and orifice parameters. M.G.

N85-10985*# Garrett Turbine Engine Co., Phoenix, Ariz.
DILUTION JET MIXING
S. Srinivasan *In* NASA. Lewis Research Center Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 315-329 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Schematics are given for test section configurations, orifice configurations, and the dilution jet mixing test rig used to collect a data base on mixing a single sided and a two sided row of jets with a confined cross flow. Parameters investigated include momentum ratio; nonuniform cross stream temperature and velocity profiles; cold/hot injection, and cross stream flow area convergence. Graphs show measured theta momentum distributions for: (1) in line and staggered orifice configurations; and (2) the profiled mainstream; and (3) flow area convergence. A.R.H.

N85-10986*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION SYSTEM FOR RADIATION INVESTIGATIONS
J. D. Wear *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 331-334 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

An inlet interface flange, inlet diffuser, fuel struts and nozzles, combustor liner, liner housing and exhaust flange comprise a system to be installed in an existing test facility. The system was designed for operation at 40 atmospheres inlet pressure, 900 K inlet temperature, and air flow to 80 kg/sec. Six penetrations are provided in the outer pressure housing. Adapters at the penetrations, permit use of various types of radiation instrumentation. Five total radiation radiometers and two heat flux gases were

installed. Rotating exhaust instrumentation can also be used to determine combustor performance. Data are presented showing total radiation at three axial positions of the combustor, and comparison of total radiation with data from a heat flux gage.
A.R.H.

N85-10987*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VALIDATION OF STRUCTURAL ANALYSIS METHODS USING THE IN-HOUSE LINER CYCLIC RIGS
Robert L. Thompson *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 335-344 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

Test conditions and variables to be considered in each of the test rigs and test configurations, and also used in the validation of the structural predictive theories and tools, include: thermal and mechanical load histories (simulating an engine mission cycle; different boundary conditions; specimens and components of different dimensions and geometries; different materials; various cooling schemes and cooling hole configurations; several advanced burner liner structural design concepts; and the simulation of hot streaks. Based on these test conditions and test variables, the test matrices for each rig and configurations can be established to verify the predictive tools over as wide a range of test conditions as possible using the simplest possible tests. A flow chart for the thermal/structural analysis of a burner liner and how the analysis relates to the tests is shown schematically. The chart shows that several nonlinear constitutive theories are to be evaluated. A.R.H.

N85-10988*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOST LINER CYCLIC FACILITIES: FACILITY DESCRIPTION
Donald Schultz *In its* Turbine Eng. Hot Sect. Technol. (HOST) Oct. 1982 p 345-360 (For primary document see N85-10951 02-07)
Avail: NTIS HC A16/MF A01 CSCL 21E

A quartz lamp box, a quartz lamp annular rig, and a low pressure liner cyclic can rig planned for liner cyclic tests are described. Special test instrumentation includes an IR-TV camera system for measuring liner cold side temperatures, thin film thermocouples for measuring liner hot side temperatures, and laser and high temperature strain gages for obtaining local strain measurements. A plate temperature of 2,000 F was obtained in an initial test of an apparatus with three quartz lamps. Lamp life, however, appeared to be limited for the standard commercial quartz lamps available. The design of vitiated and nonvitiated preheaters required for the quartz lamp annular rig and the cyclic can test rigs is underway.
A.R.H.

N85-10989*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE COMPONENT DEVELOPMENT AND INTEGRATION PROGRAM Semiannual Report, 1 Oct. 1981 - 31 Mar. 1982
Apr. 1982 346 p
(Contract NAS3-20643)
(NASA-CR-169496; NAS 1.26:169496; R82AEB285; SAR-8) Avail: NTIS HC A15/MF A01 CSCL 21E

The development of the technology to improve energy efficiency of propulsion systems for subsonic commercial aircrafts was examined. Goals established include: (1) fuel consumption, reduction in flight propulsion system; (2) direct operation cost; (3) noise, with provision for engine growth corresponding to future engine application; and (4) emissions, EPA new engine standards.
E.A.K.

N85-10990*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE COMPONENT DEVELOPMENT AND INTEGRATION PROGRAM Semiannual Report, 1 Apr. - 30 Sep. 1981
30 Oct. 1981 338 p
(Contract NAS3-20643)
(NASA-CR-170034; NAS 1.26:170034; R81AEG709; SAR-7) Avail: NTIS HC A15/MF A01 CSCL 21E

Accomplishments in the Energy Efficient Engine Component Development and Integration program during the period of April 1, 1981 through September 30, 1981 are discussed. The major topics considered are: (1) propulsion system analysis, design, and integration; (2) engine component analysis, design, and development; (3) core engine tests; and (4) integrated core/low spool testing.
R.S.F.

N85-10991*# TRW, Inc., Cleveland, Ohio. Materials Technology.
ENERGY EFFICIENT ENGINE. VOLUME 2. APPENDIX A: COMPONENT DEVELOPMENT AND INTEGRATION PROGRAM Final Semiannual Status Report, 1 Apr. - 30 Sep. 1981
D. J. Moracz and C. R. Cook East Hartford, Conn. Pratt and Whitney Aircraft 30 Oct. 1981 200 p ref Prepared for Pratt and Whitney Aircraft, East Hartford, Conn. 2 Vol.
(Contract NAS3-20646)
(NASA-CR-173085; NAS 1.26:173085;
PWA-5594-179-Vol-2-App-A; ER-8050-F-Vol-2-App-A;
SASR-7-Vol-2-App-A) Avail: NTIS HC A09/MF A01 CSCL 21E

The large size and the requirement for precise lightening cavities in a considerable portion of the titanium fan blades necessitated the development of a new manufacturing method. The approach which was selected for development incorporated several technologies including HIP diffusion bonding of titanium sheet laminates containing removable cores and isothermal forging of the blade form. The technology bases established in HIP/DB for composite blades and in isothermal forging for fan blades were applicable for development of the manufacturing process. The process techniques and parameters for producing and inspecting the cored diffusion bonded titanium laminate blade preform were established. The method was demonstrated with the production of twelve hollow simulated blade shapes for evaluation. Evaluations of the critical experiments conducted to establish procedures to produce hollow structures by a laminate/core/diffusion bonding approach are included. In addition the transfer of this technology to produce a hollow fan blade is discussed.
B.G.

N85-10992*# Pratt and Whitney Aircraft, East Hartford, Conn. Commercial Products Div.
ENERGY EFFICIENT ENGINE. VOLUME 1: COMPONENT DEVELOPMENT AND INTEGRATION PROGRAM Semiannual Status Report, 1 Apr. - 30 Sep. 1981
30 Oct. 1981 228 p 2 Vol.
(Contract NAS3-20646)
(NASA-CR-173084; NAS 1.26:173084; PWA-5594-179-Vol-1;
SASR-7-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 21E

Technology for achieving lower installed fuel consumption and lower operating costs in future commercial turbofan engines are developed, evaluated, and demonstrated. The four program objectives are: (2) component analysis, design, and development; (3) core design, fabrication, and test; and (4) integrated core/low spoon design, fabrication, and test.
B.G.

N85-10993*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE ICLS NACELLE DETAIL DESIGN REPORT
R. R. Eskridge, A. P. Kuchar, and C. L. Stotler Jul. 1982 125 p ref
(Contract NAS3-20643)
(NASA-CR-167870; NAS 1.26:167870; R81AEG700) Avail: NTIS HC A06/MF A01 CSCL 21E

The results of the detail design of the Nacelle for the General Electric Energy Efficient Engine (E3) Integrated Core Low Spool (ICLS) test vehicles are presented. A slave nacelle is designed for the ICLS test. Cost and reliability are the important factors considered. The slave nacelle simulates the internal flow lines of

the actual Flight Propulsion System (FPS) but has no external fairing. The aerodynamic differences between the ICLS and FPS nacelles are presented, followed by the structural description and analysis of the various nacelle components. M.A.C.

N85-10994*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE. LOW PRESSURE TURBINE TEST HARDWARE DETAILED DESIGN REPORT
D. G. Cherry, C. H. Gay, and D. T. Lenahan Aug. 1982 186 p (Contract NAS3-20643)
(NASA-CR-167956; NAS 1.26:167956; R81AEG597) Avail: NTIS HC A09/MF A01 CSCL 21E

The low pressure turbine for the energy efficient engine is a five-stage configuration with moderate aerodynamic loading incorporating advanced features of decambered airfoils and extended blade overlaps at platforms and shrouds. Mechanical integrity of 18,000 hours on flowpath components and 36,000 hours on all other components is achieved along with no aeromechanical instabilities within the steady-state operating range. Selection of a large number (156) of stage 4 blades, together with an increased stage 4 vane-to-blade gap, assists in achieving FAR 36 acoustic goals. Active clearance control (ACC) of gaps at blade tips and interstage seals is achieved by fan air cooling judiciously applied at responsive locations on the casing. This ACC system is a major improvement in preventing deterioration of the 0.0381 cm (0.015 in.) clearances required to meet the integrated-core/low-spool turbine efficiency goal of 91.1% and the light propulsion system efficiency goal of 91.7%. Author

N85-10995*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE HIGH PRESSURE TURBINE TEST HARDWARE DETAILED DESIGN REPORT
E. E. Halila, D. T. Lenahan, and T. T. Thomas Jun. 1982 194 p refs
(Contract NAS3-20643)
(NASA-CR-167955; NAS 1.26:167955; R81AEG284) Avail: NTIS HC A09/MF A01 CSCL 21E

The high pressure turbine configuration for the Energy Efficient Engine is built around a two-stage design system. Moderate aerodynamic loading for both stages is used to achieve the high level of turbine efficiency. Flowpath components are designed for 18,000 hours of life, while the static and rotating structures are designed for 36,000 hours of engine operation. Both stages of turbine blades and vanes are air-cooled incorporating advanced state of the art in cooling technology. Direct solidification (DS) alloys are used for blades and one stage of vanes, and an oxide dispersion system (ODS) alloy is used for the Stage 1 nozzle airfoils. Ceramic shrouds are used as the material composition for the Stage 1 shroud. An active clearance control (ACC) system is used to control the blade tip to shroud clearances for both stages. Fan air is used to impinge on the shroud casing support rings, thereby controlling the growth rate of the shroud. This procedure allows close clearance control while minimizing blade tip to shroud rubs. Author

N85-10996*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE HIGH PRESSURE TURBINE CERAMIC SHROUD SUPPORT TECHNOLOGY REPORT
W. A. Nelson and R. G. Carlson Nov. 1982 56 p refs
(Contract NAS3-20643)
(NASA-CR-168036; NAS 1.26:168036; R82AEB399) Avail: NTIS HC A04/MF A01 CSCL 21E

This work represents the development and fabrication of ceramic HPT (high pressure turbine) shrouds for the Energy Efficient Engine (E3). Details are presented covering the work performed on the ceramic shroud development task of the NASA/GE Energy Efficient Engine (E3) component development program. The task consists of four phases which led to the selection of a ZrO2-8Y2O3 ceramic shroud material system, the development of an automated plasma spray process to produce acceptable shroud structures, the fabrication of select shroud systems for evaluation in laboratory, component, and CF6-50 engine testing, and finally, the successful fabrication of ZrO2-8Y2O3/superpeg, engine quality shrouds for the E3 engine. Author

N85-10997*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE ICLS ENGINE BEARINGS, DRIVES AND CONFIGURATION: DETAIL DESIGN REPORT
C. L. Broman Jun. 1982 76 p refs
(Contract NAS3-20643)
(NASA-CR-167871; NAS 1.26:167871; R81AEG821) Avail: NTIS HC A05/MF A01 CSCL 21E

The detailed design of the forward and aft sumps, the accessory drive system, the lubrication system, and the piping/manifold configuration to be employed in the ICLS engine test of the Energy Efficient Engine is addressed in the report. The design goals for the above components were established based on the requirements of the test cell engine. Author

N85-10998*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ENERGY EFFICIENT ENGINE. HIGH PRESSURE COMPRESSOR DETAIL DESIGN REPORT
P. R. Holloway, C. C. Koch, G. L. Knight, and S. L. Shaffer May 1982 168 p refs
(Contract NAS3-20643)
(NASA-CR-165558; NAS 1.26:165558; R81AEG710) Avail: NTIS HC A08/MF A01 CSCL 21E

A compressor optimization study defined a 10-stage configuration with a 22.6:1 pressure ratio, and adiabatic efficiency goal of 86.1%, and a polytropic efficiency of 90.6%; the corrected airflow is 53.5 kg/sec. Subsequent component testing included three full-scale tests: a six-stage rig test, and another 10-stage rig test completed in the second quarter of 1982. Information from these tests is being used to select the configuration for a core engine test scheduled for July 1982 and an integrated core/low spool test slated for early 1983. The test results will also provide data base for the flight propulsion system. Author

N85-10999*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ADVANCED BLADE TIP SEAL SYSTEM, VOLUME 2 Final Report
J. W. Zelahy and N. P. Fairbanks Feb. 1982 28 p
(Contract NAS3-20074)
(NASA-CR-167851; NAS 1.26:167851; TIS-R82AEB403-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 21E

The results of the endurance and performance engine tests conducted on monocrystal/abrasive-tipped CF6-50 Stage 1 HPT blades fabricated in Task VII of MATE Project 3 are presented. Two engine tests are conducted. The endurance engine test is conducted for 1000 C cycles. The performance engine test is conducted on a variable cycle core engine. Posttest evaluation and analyses of the blades and shrouds included visual, dimensional, and destructive evaluations. M.A.C.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-11000 Wichita State Univ., Kans.
MODEL SIMPLIFICATION OF FLIGHT CONTROL SYSTEMS Ph.D. Thesis
Minh Thanh Tran 1983 128 p
Avail: Univ. Microfilms Order No. DA8412645

Large scale linear shift invariant discrete time systems satisfying the two time scale property are considered. Design techniques based on complete separation of slow and fast subsystems are

developed. The slow and fast subsystem performances are obtained and compared to those of the original system. Subsystem regulator design problems are investigated and the controllability and observability properties of the system are studied based on the corresponding properties of the subsystems. Stabilizing controller design methods are developed based on the separability of the slow and fast controllers. Subsystem outputs are compared to those of the original system by using output feedback design. In the case where these systems are controlled by more than one decision maker with direct conflict, the zero sum Nash strategies are employed to derive near optimal solutions based on the slow and fast subsystems separately. The composite performance is analytically compared to the optimal performance. Quadratic performance indices are used for this purpose.
Dissert. Abstr.

N85-11001*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
A RESEARCH PROGRAM IN ACTIVE CONTROL/ AEROELASTICITY IN THE JIAFS AT NASA LANGLEY RESEARCH CENTER Semiannual Status Report, Apr. - Sep. 1984
John L. Whitesides Sep. 1984 8 p refs
(NASA-CR-174052; NAS 1.26:174052) Avail: NTIS HC A02/MF A01 CSCL 01C

A control law synthesis methodology for multifunctional active control system to satisfy root-mean-square load and response constraints as well as to meet stability robustness requirements at plant input and output was developed. Modern control theory, singular value analysis and optimization techniques were utilized. All stability and response derivative expressions were derived analytically for sensitivity study. The software is incorporated as an update to the AB/LAD general control design software package PADLOCS. Author

N85-11002*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR STUDY OF FLIGHT CHARACTERISTICS OF SEVERAL LARGE, DISSIMILAR, CARGO TRANSPORT AIRPLANES DURING APPROACH AND LANDING
William D. Grantham, Paul M. Smith (Kentron International, Inc.), Perry L. Deal (Air Force Systems Command), and William R. Neely, Jr. Nov. 1984 88 p refs
(NASA-TP-2357; L-15805; NAS 1.60:2357) Avail: NTIS HC A05/MF A01 CSCL 01C

A six-degree-of-freedom, ground based simulator study is conducted to evaluate the low-speed flight characteristics of four dissimilar cargo transport airplanes. These characteristics are compared with those of a large, present-day (reference) transport configuration similar to the Lockheed C-5A airplane. The four very large transport concepts evaluated consist of single-fuselage, twin-fuselage, triple-fuselage, and span-loader configurations. The primary piloting task is the approach and landing operation. The results of his study indicate that all four concepts evaluated have unsatisfactory longitudinal and lateral directional low speed flight characteristics and that considerable stability and control augmentation would be required to improve these characteristics (handling qualities) to a satisfactory level. Through the use of rate command/ attitude hold augmentation in the pitch and roll axes, and the use of several turn-coordination features, the handling qualities of all four large transports simulated are improved appreciably. M.A.C.

N85-11003*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
INTERACTIVE AIRCRAFT FLIGHT CONTROL AND AEROELASTIC STABILIZATION Semiannual Report, 1 May - 31 Oct. 1984
Terrence A. Weisshaar Nov. 1984 19 p
(Grant NAG1-157)
(NASA-CR-174025; NAS 1.26:174025) Avail: NTIS HC A02/MF A01 CSCL 01C

An analytical model has been used to study the problem of integrated control system/structural dynamic design. This model utilizes the traditional typical section lifting surface with a control surface attached in 2-D unsteady incompressible flow. The studies have as their purpose the examination of the use of the location of the elastic axis of the airfoil as a design variable in the search for an actively controlled configuration that has a specified flutter margin. Items of interest include the determination of flutter speed and divergence speed as functions of a nondimensional parameter, a sub c, that measures the location (in semi-chords) of the elastic axis with respect to the airfoil midchord. All other parameters are fixed. The behavior of velocity root locus curves with changes in a sub c is illustrated. Also shown is an example of the use of sensitivity derivatives to reposition poles of the open loop system. The behavior of the actively controlled or closed loop system is also discussed. A set of examples are presented to indicate how the shear center parameter, a sub c, affects the design of the controlled system. B.W.

N85-11004*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRCREW-AIRCRAFT INTEGRATION: A SUMMARY OF US ARMY RESEARCH PROGRAMS AND PLANS
David L. Key and Edwin W. Aiken Oct. 1984 24 p refs
(NASA-TM-85991; A-8853; NAS 1.15:85991;
USAAVSCOM-TR-84-A-4) Avail: NTIS HC A02/MF A01 CSCL 01C

A review of selected programs which illustrate the research efforts of the U.S. Army Aeromechanics Laboratory in the area of aircrew-aircraft integration is presented. Plans for research programs to support the development of future military rotorcraft are also described. The crew of a combat helicopter must, in general, perform two major functions during the conduct of a particular mission: flightpath control and mission management. Accordingly, the research programs described are being conducted in the same two major categories: (1) flightpath control, which encompasses the areas of handling qualities, stability and control, and displays for the pilot's control of the rotorcraft's flightpath, and (2) mission management, which includes human factors and cockpit integration research topics related to performance of navigation, communication, and aircraft systems management tasks. Author

N85-11005*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT-LONGITUDINAL HANDLING QUALITIES STUDY OF A RELAXED-STABILITY AIRPLANE Final Contractor Report, Feb. - Dec. 1981
Washington NASA Jan. 1983 59 p refs
(Contract NAS1-15325)
(NASA-CR-3660; NAS 1.26:3660; D6-51147) Avail: NTIS HC A04/MF A01 CSCL 01C

The results of a piloted simulation of longitudinal handling qualities of an airplane with relaxed static stability are described. This task was performed under the Integrated Application of Active Controls (IAAC) Technology Project within the NASA Energy Efficient Transport Program. A representative medium range transport airplane, the Boeing Model 757, was simulated. Evaluations were made of the unaugmented airplane and of the airplane with an Essential Pitch Augmented Stability (PAS) System and with a Primary PAS System at various center of gravity (cg) conditions. Level 2 pilot ratings were attained with cg locations aft to about 57% mean aerodynamic chord (MAC) or 6% aft of the neutral point for unaugmented landing approach. For Mach = 0.80, unaugmented cruise Level 2 ratings were attained to 47% MAC or 5% forward of the maneuver point. The augmented airplane model provided handling qualities close to or within the Level 1 boundary at all cg locations for both Essential and Primary PAS. Analyses of the test conditions when compared with existing handling qualities criteria based on classical unaugmented airplane characteristics agreed well with the pilot ratings. The unaugmented results are comparable to those reported by both the Douglas Aircraft Company and Lockheed California Company from simula-

tion investigations of transport configurations with roughly similar dimensional and mass characteristics. B.W.

N85-11006*# Lockheed-California Co., Burbank.
DEVELOPMENT AND FLIGHT EVALUATION OF AN AUGMENTED STABILITY ACTIVE CONTROLS CONCEPT: EXECUTIVE SUMMARY Contractor Report, Dec. 1978 - Apr. 1982
Wiley A. Guinn 19 Nov. 1982 22 p
(Contract NAS1-15326)
(NASA-CR-166009; NAS 1.26:166009; LR-30208-1) Avail: NTIS HC A02/MF A01 CSCL 01C

A pitch active control system (PACS) was developed and flight tested on a wide body jet transport (L-1011) with a flying horizontal stabilizer. Two dual channel digital computers and the associated software provide command signals to a dual channel series servo which controls the stabilizer power actuators. Input sensor signals to the computer are pitch rate, column trim position, and dynamic pressure. Control laws are given for the PACS and the system architecture is defined. Discussions are given regarding piloted flight simulation and vehicle system simulation and vehicle system simulation tests that are performed to verify control laws and system operation prior to installation on the aircraft. Modifications to the basic aircraft included installation of the PACS, addition of a c.g. management system to provide a c.g. range from 25 to 39% mac, and downrigging of the geared elevator to provide the required nose down control authority for aft c.g. flight test conditions. Three pilots used the Cooper-Harper Rating Scale to judge flying qualities of the aircraft with PACS on and off. The handling qualities with the c.g. at 39% mac (41% stability margin) and PACS operating were judged to be as good as the handling qualities with the c.g. at 25% mac (+15% stability margin) and PACS off. B.W.

N85-11007# McDonnell Aircraft Co., St. Louis, Mo.
DEFINITION OF ACCEPTABLE LEVELS OF MISMATCH FOR EQUIVALENT SYSTEMS OF AUGMENTED CTOL (CONVENTIONAL TAKE-OFF AND LANDING) AIRCRAFT
J. R. Wood and J. Hodgkinson 19 Dec. 1980 74 p
(AD-A145619; MDC-A6792) Avail: NTIS HC A04/MF A01 CSCL 01/4

High order pitch rate frequency responses of augmented aircraft can be broken down into the response of a low order equivalent system, and the mismatch between the response of the actual high order system and the low order equivalent. This study used variable stability NT-33 in-flight data to define frequency response envelopes of acceptable levels of mismatch. The envelopes were narrowest in a region believed to coincide with the piloted crossover region. The computer program for obtaining the equivalent system was then modified to weight the match in the crossover region. Equivalent system summaries for the LAHOS and Neal-Smith data sets are included. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-11008# Aeronautical Research Labs., Melbourne (Australia).
ATMOSPHERIC AND PRESSURIZED LOW SPEED WIND TUNNEL PERFORMANCE AND COST COMPARISONS
N. Matheson May 1984 77 p refs
(ARL-AERO-R-160; AR-003-027) Avail: NTIS HC A05/MF A01

The performance of a series of low-speed wind tunnels designed to operate at various maximum pressures ranging from 2 to 5 atmospheres is estimated and compared with the performance of a similar atmospheric tunnel on the basis of capital cost and power input. The choice of the design of a new tunnel is usually influenced by cost and power considerations and it is important to provide the most capable design and to maximize performance within given limits of these variables. Pressurization offers a major advantage in allowing R sub N and M sub N effects to be investigated separately. This can be particularly important for tests of modern aircraft configurations at high lift. For the same capital cost and power consumption pressurization allows the maximum R sub N and M sub N to be increased substantially, but the working section is much smaller. This may make it difficult to satisfy some test requirements particularly for V/STOL aircraft. Models for a pressurized tunnel are also more complex and may be more costly because they must withstand much higher aerodynamic loads. To illustrate the effects of tunnel pressurization, the analysis is applied to a tandem section low-speed tunnel previously suggested as suitable for future Australian test requirements. Author

N85-11009*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTATIONS FOR THE 16-FOOT TRANSONIC TUNNEL, NASA, LANGLEY RESEARCH CENTER
Charles E. Mercer, Bobby L. Berrier, Francis J. Capone, Alan M. Grayston, and C. D. Sherman Oct. 1984 189 p
(NASA-TM-86319; NAS 1.15:86319) Avail: NTIS HC A09/MF A01 CSCL 14B

The equations used by the 16 foot transonic tunnel in the data reduction programs are presented in eight modules. Each module consists of equations necessary to achieve a specific purpose. These modules are categorized in the following groups: (1) wind tunnel parameters, (2) jet exhaust measurements, (3) skin friction drag, (4) balance loads and model attitudes, (5) internal drag (or exit flow distributions), (6) pressure coefficients and integrated forces, (7) thrust removal options, and (8) turboprop options. R.J.F.

N85-11010# Maryland Univ., College Park. Dept. of Civil Engineering.
STRUCTURAL DESIGN GUIDELINES FOR HELIPORTS Final Report, 5 Dec. 1983 - 10 Oct. 1984
C. W. Schwartz, M. W. Witczak, and R. B. Leahy Washington FAA Oct. 1984 115 p refs Prepared for Systems Control Technoloy, Inc., West Palm Beach, Fla.
(Contract DTFA01-80-C-10080)
(FAA-PM-84-23) Avail: NTIS HC A06/MF A01

Current structural design guidelines for heliports are analyzed using data obtained from the literature and from surveys of helicopter manufacturers, heliport design consultants, and heliport operators. Primary topics of interest in these analyses are the loads on heliport structures caused by helicopter hard landing, rotor downwash, and helicopter vibrations. A new analysis, based on reliability theory, is proposed for determining the helicopter hard landing load magnitudes appropriate for structural design. Results from this analysis indicate that the current FAA heliport structural design guidelines are adequate for medium to high volume heliports and conservative for low volume facilities. Additional analyses indicate that rotor downwash pressures and helicopter-induced vibrations are not critical loading conditions for most heliport structures. Guidelines for appropriate load combinations for heliport structural design are also presented. Author

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-11011*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SECOND SYMPOSIUM ON SPACE INDUSTRIALIZATION
Camille M. Jernigan, ed. Oct. 1984 427 p refs Symp. held in Huntsville, Ala., 13-15 Feb. 1984 Sponsored in cooperation with AIAA and Alabama Univ.

(NASA-CP-2313; M-464; NAS 1.55:2313) Avail: NTIS HC A19/MF A01 CSCL 22A

The policy, legal, and economic aspects of space industrialization are considered along with satellite communications, material processing, remote sensing, and the role of space carriers and a space station in space industrialization. For individual titles, see N85-11012 through N85-11057.

N85-11012*# National Aeronautics and Space Administration, Washington, D. C.
NON-US APPROACHES TO SPACE COMMERCIALIZATION
Peter G. Smith *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 2-27 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

The approaches to the commercialization of space taken by the four foreign countries most active in the field - Canada, France, the Federal Republic of Germany, and Japan are described. National space program elements with commercial potential are examined in the context of national industrial and science policies, with special attention to objectives, timetables, and budgetary priority relative to other sectors. The role of the European Space Agency in attaining national and regional commercialization objectives is also examined. Author

N85-11013*# National Aeronautics and Space Administration, Washington, D. C.
LEGAL CONSIDERATIONS AND COOPERATIVE OPPORTUNITIES FOR SPACE COMMERCIAL ACTIVITIES c84
S. Neil Hosenball *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 28-37 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05D

It is a national policy to make the capabilities of the Space Transportation System available to a wide range of potential users. This includes its availability as a space manufacturing facility for commercial activities, which may be carried out on a reimbursable basis or as a joint endeavor with NASA, but with substantial private investment. In any high risk, long lead-time research and development activity directed towards commercialization, the protection afforded the results of the research and development under the laws relating to intellectual property rights may provide an important incentive for private investment. The policies and practices of NASA directed towards the protection of privately-established intellectual property rights involved in STS use are reviewed with particular emphasis on reimbursable launch agreements and joint endeavor agreements. R.S.F.

N85-11014*# Coopers and Lybrand, Washington, D.C.
FINANCIAL ISSUES FOR COMMERCIAL SPACE VENTURES: PAYING FOR THE DREAMS c83
John J. Egan *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 38-47 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05C

Various financial issues involved in commercial space enterprise are discussed. Particular emphasis is placed on the materials processing area: the current state of business plan and financial developments, what is needed for enhanced probability of success of future materials development efforts in attracting financial backing, and finally, the risks involved in this entire business area. R.S.F.

N85-11015*# Science Applications, Inc., McLean, Va.
SPACE INDUSTRIALIZATION: A NATIONAL PERSPECTIVE
Victor H. Reis *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 48-51 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

Space industrialization (or commercialization) has the potential to be a major player in America's space program. If this potential is to be realized, however, industrialization efforts must be considered within the context of the other major portions of the space program: shuttle, space station, and civil remote sensing. Further, development efforts must be based upon a sound scientific and technical understanding of the products and processes, and there must be a trained cadre of dedicated individuals willing to devote time and effort to this effort. There remain considerable risks and uncertainties. Given all this, the best path to follow would seem to be a long term, balanced commitment, emphasizing government, industry, and academia partnerships. Several points are addressed: (1) the place of space industrialization in the overall national space program; (2) the meaning of space industrialization with respect to the historic, national aims of space; and (3) specifically what is being industrialized. R.S.F.

N85-11016*# Auburn Univ., Ala. Dept. of Electrical Engineering.
THE COMPUTER-COMMUNICATION LINK FOR THE INNOVATIVE USE OF SPACE STATION Abstract Only c32
Chester C. Carroll *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 52 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 17B

The potential capability of the computer-communications system link of space station is related to innovative utilization for industrial applications. Conceptual computer network architectures are presented and their respective accommodation of innovative industrial projects are discussed. To achieve maximum system availability for industrialization is a possible design goal, which would place the industrial community in an interactive mode with facilities in space. A worthy design goal would be to minimize the computer-communication management function and thereby optimize the system availability for industrial users. Quasi-autonomous modes and subnetworks are key design issues, since they would be the system elements directly effecting the system performance for industrial use. R.S.F.

N85-11017*# Turner Broadcasting System, Atlanta, Ga.
THE REAL WORLD: THE USER c32
James Kitchell *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 53-59 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 17B

Satellite communication is by far the most advanced of all commercial applications of space technology. The past, present, and some future possibilities for the field of public communications are considered. Some serious concerns that are becoming apparent to the user of this technology are examined. Among the specific topics mentioned are digital television, electronic mail, cable television, and systems security. R.S.F.

N85-11018*# Arizona Univ., Tucson. Biophysics Technology Lab.
OPPORTUNITIES FOR SPACE BIOPROCESSING
Milan Bier *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 60-64 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

The need for improved purification technologies, the role of electrophoresis, and isoelectric focusing are discussed in the context of space bioprocessing. R.S.F.

N85-11019*# Utah Univ., Salt Lake City. Dept. of Physics.
THE ABSENCE OF CONVECTIVE STABILITY IN INCONGRUENT CRYSTAL GROWTH ON EARTH Abstract Only c76
Franz Rosenberger *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 65 (For primary document see N85-11011 02-12)
(Grant NsG-1534)
Avail: NTIS HC A19/MF A01 CSCL 20B

It is often assumed that convection can be excluded in materials processing by avoiding horizontal temperature gradients, and employing top-heating and horizontal interfaces. Model calculations for vapor transport processes show that this supposition holds only for strictly congruent vapor-solid transitions. This

result can be generalized to all fluid-solid phase transitions. Due to the omnipresence of impurity segregation, it is concluded that convective stability is practically unattainable in materials processing on Earth. Author

N85-11020*# Missouri Univ., Rolla.
POTENTIAL UTILIZATION OF GLASS EXPERIMENTS IN SPACE c27
Norbert J. Kreidl *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 66-73 refs Prepared in cooperation with New Mexico Univ., Albuquerque and Santa Fe Coll., New Mex. (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11B

Materials processing in space utilizing the microgravity environment is discussed; glass processing in particular is considered. Attention is given to the processing of glass shells, critical cooling rate and novel glasses, gel synthesis of glasses, immiscibility, surface tension, and glass composites. Soviet glass experiments in space are also enumerated. R.S.F.

N85-11021*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PREPARATION OF LARGE-PARTICLE-SIZE MONODISPERSE LATEXES IN SPACE: THE STS-3, STS-4, AND STS-7 MISSION RESULTS Abstract Only c27
John W. Vanderhoff, M. S. El-Aasser, F. J. Micale, E. D. Sudol, C. M. Tseng, A. Silwanowicz, and D. M. Kornfeld *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 75 Prepared in cooperation with Lehigh Univ., Bethlehem, Pa. (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11G

Large-particle-size monodisperse latexes were prepared on four STS missions of the space shuttles Columbia and Challenger using flight hardware comprising four automated 100 cm(3) polymerization reactors. Seven polymerizations carried out on the March 1982 STS-3 mission of the Columbia, and the April 1983 STS-6 and June 1983 STS-7 missions of the Challenger, gave monodisperse latexes of 5 to 18 micron diameter with narrower particle size distributions than the corresponding ground-based control polymerizations. The rates of polymerization in microgravity were the same as on Earth. The results of these experiments are reviewed, and the prospects of the development of a space production process are discussed. R.S.F.

N85-11022*# Deere and Co., Moline, Ill.
LOW-GRAVITY SOLIDIFICATION OF CAST IRON AND SPACE TECHNOLOGY APPLICATIONS c26
James A. Graham *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 75-81 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11F

Two types of analyses relating to cast iron solidification were conducted. A theoretical analysis using a computer to predict the cooling versus time relationship throughout the test specimen was performed. Tests were also conducted in a ground-based laboratory to generate a cooling time curve for cast iron. In addition, cast iron was cooled through the solidification period on a KC-135 and an F-104 aircraft while these aircraft were going through a period of low gravity. Future subjects for low gravity tests are enumerated. R.S.F.

N85-11023*# Microgravity Research Associates, Inc., Coral Gables, Fla.
PRODUCING GALLIUM ARSENIDE CRYSTALS IN SPACE c76
Richard L. Randolph *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 82-86 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 20B

The production of high quality crystals in space is a promising near-term application of microgravity processing. Gallium arsenide is the selected material for initial commercial production because of its inherent superior electronic properties, wide range of market applications, and broad base of on-going device development effort. Plausible product prices can absorb the high cost of space transportation for the initial flights provided by the Space Transportation System. The next step for bulk crystal growth, beyond the STS, is planned to come later with the use of free flyers or a space station, where real benefits are foreseen. The use of these vehicles, together with refinement and increasing automation of space-based crystal growth factories, will bring down costs and will support growing demands for high quality GaAs and other specialty electronic and electro-optical crystals grown in space. Author

N85-11024*# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data, and Information Service.
LAND REMOTE SENSING COMMERCIALIZATION: A STATUS REPORT c43
William P. Bishop and E. Larry Heacock *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 87-95 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

The current offer by the United States Department of Commerce to transfer the U.S. land remote sensing program to the private sector is described. A Request for Proposals (RFP) was issued, soliciting offers from U.S. firms to provide a commercial land remote sensing satellite system. Proposals must address a complete system including satellite, communications, and ground data processing systems. Offerors are encouraged to propose to take over the Government LANDSAT system which consists of LANDSAT 4 and LANDSAT D'. Also required in proposals are the market development procedures and plans to ensure that commercialization is feasible and the business will become self-supporting at the earliest possible time. As a matter of Federal Policy, the solicitation is designed to protect both national security and foreign policy considerations. In keeping with these concerns, an offeror must be a U.S. Firm. Requirements for data quality, quantity, distribution and delivery are met by current operational procedures. It is the Government's desire that the Offeror be prepared to develop and operate follow-on systems without Government subsidies. However, to facilitate rapid commercialization, an offeror may elect to include in his proposal mechanisms for short term government financial assistance. M.G.

N85-11025*# Metrics, Inc., Atlanta, Ga.
THE FUTURE OF SATELLITE REMOTE SENSING: A WORLD-WIDE ASSESSMENT AND PREDICTION Abstract Only c43
G. William Spann *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 96 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

A frame-work in which to assess and predict the future prospects for satellite remote sensing markets is provided. The scope of the analysis is the satellite-related market for data, equipment, and services. It encompasses both domestic and international markets and contains an examination of the various market characteristics by market segment (e.g., Federal Government, State and Local Governments, Academic Organizations, Industrial Companies, and Individuals) and primary applications areas (e.g., Geology, Forestry, Land Resource Management, Agriculture and Cartography). The forecasts are derived from an analysis of both U.S. and foreign market data. The evolution and current status of U.S. and Foreign markets to arrive at market growth rates is evaluated. Circumstances and events which are likely to affect the future market development are examined. A market growth scenario is presented that is consistent with past data sales trends and takes into account the dynamic nature of the future satellite remote sensing market. Several areas of current and future business opportunities available in this market are discussed. Specific worldwide forecasts are presented in three market sectors for the period 1980 to 1990. M.G.

N85-11026*# Geosat Committee, Inc., San Francisco, Calif.
INDUSTRIAL USE OF LAND OBSERVATION SATELLITE SYSTEMS c43

Frederick B. Henderson, III *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 97-101 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

The principal industrial users of land observation satellite systems are the geological industries; oil/gas, mining, and engineering/environmental companies. The primary system used is LANDSAT/MSS. Currently, use is also being made of the limited amounts of SKYLAB photography, SEASAT and SIR-A radar, and the new LANDSAT/TM data available. Although considered experimental, LANDSAT data is now used operationally by several hundred exploration and engineering companies worldwide as a vastly improved geological mapping tool to help direct more expensive geophysical and drilling phases, leading to more efficient decision-making and results. Future needs include global LANDSAT/TM; higher spatial resolution; stereo and radar; improved data handling, processing distribution and archiving systems, and integrated geographical information systems (GIS). For a promising future, governments must provide overall continuity (government and/or private sector) of such systems, insure continued government R and D, and commit to operating internationally under the civil Open Skies policy. M.G.

N85-11027*# Space Services Inc. of America, Bethesda, Md.
SPACE AMERICA'S COMMERCIAL SPACE PROGRAM Abstract Only
N. H. MacLeod *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 102 Prepared in cooperation with American Science and Technologies Corp., Bethesda, Md. and Aeros Data Corp., Bethesda, Md. (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

Space America prepared a private sector land observing space system which includes a sensor system with eight spectral channels configured for stereoscopic data acquisition of four stereo pairs, a spacecraft bus with active three-axis stabilization, a ground station for data acquisition, preprocessing and retransmission. The land observing system is a component of Space America's end-to-end system for Earth resources management, monitoring and exploration. In the context of the Federal Government's program of commercialization of the US land remote sensing program, Space America's space system is characteristic of US industry's use of advanced technology and of commercial, entrepreneurial management. Well before the issuance of the Request for Proposals for Transfer of the United States Land Remote Sensing Program to the Private Sector by the US Department of Commerce, Space Services, Inc., the managing venturer of Space America, used private funds to develop and manage its sub-orbital launch of its Conestoga launch vehicle. Author

N85-11028*# Intergraph Corp., Huntsville, Ala.
LANDSAT DATA AND INTERACTIVE COMPUTER MAPPING c43
Richard K. Grady *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 103-109 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

The integration of image processing capabilities with interactive computer mapping systems is discussed. It is noted that the accomplishment of this integration will result in powerful geographic information systems which will enhance the applicatons of LANDSAT and other types of remotely sensed data in solving problems in the resource planning and management domain. M.G.

N85-11029*# Alabama A & M Univ., Normal.
AGRIBUSINESS AND SPACE: NO LIMITS TO GROWTH c43
Oscar L. Montgomery and Charles T. N. Paludan (Tennessee Univ. Space Inst., Tullahoma) *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 110-119 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 20C

Technological developments responding to world food needs are examined. It is noted that agribusiness technology has become more space-related in recent years. Although crops forecasting and improvements in yield (the green revolution) were developed prior to the space era, it would be unthinkable today to ignore the contributions of operational meteorological and communications satellites and experimental Earth observation satellites in agribusiness. Space-driven communications now permit national agribusiness database management networks, with a significant portion of the data being space-derived. In demonstration experiments, space communications were shown to improve those aspects of the food problem related to education and communications. Author

N85-11030*# Teledyne Brown Engineering, Huntsville, Ala.
SMALL PAYLOAD FLIGHT SYSTEMS (SPFS) c16
Robert A. K. Mitchell *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 120-135 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

The Small Payload Flight System (SPFS) provides a simple and cost-effective approach to carrying small size experiments on the space shuttle. The system uses a bridge-like structure which spans the orbiter cargo bay but is only 3 feet in length. The structure can carry up to 4300 lb of payload weight and can be positioned at any location along the length of the cargo bay. In addition to the structural support, the SPFS provides avionics services to experiments. These include electrical power distribution and control, command and telemetry for control of the experiments and subsystem health monitoring, and software computations. The avionics system includes a flight qualified electrical power branching distributor, and a system control unit based on the Intel 8086 microprocessor. Data can be recorded on magnetic tape or transmitted to the ground. Finally, a Freon pump and cold plate system provides environmental control for both the avionics hardware and the experiments as necessary. M.G.

N85-11031*# Boeing Aerospace Co., Seattle, Wash.
MODULAR EXPERIMENTAL PLATFORM FOR SCIENCE AND APPLICATIONS c18
Allan S. Hill *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 136-148 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

A modularized, standardized spacecraft bus, known as MESA, suitable for a variety of science and applications missions is discussed. The basic bus consists of a simple structural arrangement housing attitude control, telemetry/command, electrical power, propulsion and thermal control subsystems. The general arrangement allows extensive subsystem adaptation to mission needs. Kits provide for the addition of tape recorders, increased power levels and propulsion growth. Both 3-axis and spin stabilized flight proven attitude control subsystems are available. The MESA bus can be launched on Ariane, as a secondary payload for low cost, or on the STS with a PAM-D or other suitable upper stage. Multi-spacecraft launches are possible with either booster. Launch vehicle integration is simple and cost-effective. The low cost of the MESA bus is achieved by the extensive utilization of existing subsystem design concepts and equipment, and efficient program management and test integration techniques. M.G.

N85-11032*# European Space Agency, Paris (France). Space Transportation Systems.
EUROPEAN RETRIEVABLE CARRIER (EURECA) AND EVOLUTIONARY SPACE CARRIER FOR MICROGRAVITY, EARTH OBSERVATION AND TECHNOLOGY DEMONSTRATION c16
R. Mory and Gunther Seibert *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 147-168 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

The Spacelab relatively short stay-time in orbit has led to consideration of the European Retrievable Carrier (EURECA) concept as a reusable carrier. The EURECA concept is a free-flying carrier of experiments which is launched and recovered by the space shuttle. It is commensurate with the size of payloads that

can be economically developed in Europe and combines the advantages of Spacelab (high mass and power capability, recovery) with those of a free flyer (extended operating time in a non-polluted environment). The launch of the first EURECA mission is scheduled for October 1987. The Eureca spacecraft will be deployed from the Shuttle cargo bay in orbit, will operate in a free-flying mode for about six months, and will then be retrieved, together with its payloads, returned to Earth by the Space Shuttle and prepared for the next mission. The first mission of EURECA is dedicated to research in the fields of life sciences and material sciences. The experimental hardware of the first mission consist of a variety of processin chambers for crystal growth and equipment for biological investigations viz plant growth and protein crystallization, and there is the possibility to perform experiments in the field of exobiology. M.G.

N85-11033*# Space Vector Corp., Northridge, Calif.
CONESTOGA 2: A LOW COST COMMERCIAL SPACE TRANSPORT SYSTEM **c16**
Richard O. Rasmussen *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 169-195 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

Conestoga 2 is currently under development. It is capable of inserting 500 Kg satellites into 800 Km circular polar orbits. Conestoga 2 makes maximum use of existing (developed) technology and hardware. Its commercial objective is to fill a need for low cost low Earth orbital transport not efficiently served by Shuttle or larger space transport systems. Low Earth orbit markets, foreign participation, and launch site considerations are discussed along with technical and economic trade-offs. Author

N85-11034*# Department of Transportation, Washington, D. C. Office of Space Transportation.
COMMENTS ON THE COMMERCIALIZATION OF EXPENDABLE LAUNCH VEHICLES **c15**
Donald R. Trilling *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 196-203 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

The President's national space policy encourages private sector investment and involvement in civil space activities. Last November, the President designated the Department of Transportation as lead agency for the commercialization of expendable launch vehicles. This presents a substantial challenge to the United States Government, since the guidelines and requirements that are set now will have great influence on whether American firms can become a viable competitive industry in the world launch market. There is a dual need to protect public safety and free the private sector launch industry from needless regulatory barriers so that it can grow and prosper. Author

N85-11035*# Booz-Allen and Hamilton, Inc., Arlington, Va.
CONCEPT FOR A COMMERCIAL SPACE STATION LABORATORY **c18**
Peter W. Wood and Peter M. Stark *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 204-215 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

The concept of a privately owned and operated fee-for-service laboratory as an element of a civil manned space station, envisioned as the venture of a group of private investors and an experienced laboratory operator to be undertaken with the cooperation of NASA is discussed. This group would acquire, outfit, activate, and operate the labortory on a fee-for-service basis, providing laboratory services to commercial firms, universities, and government agencies, including NASA. This concept was developed to identify, stimulate, and assist potential commercial users of a manned space station. A number of the issues which would be related to the concept, including the terms under which NASA might consider permitting private ownership and operation of a major space station component, the policies with respect to international participation in the construction and use of the space station, the basis for charging users for services received from the space station, and the types of support that NASA might be willing to provide to assist private industry in carrying out such a venture are discussed. R.J.F.

N85-11036*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROLE OF SPACE STATION: THE HOW OF SPACE INDUSTRIALIZATION **c18**
William R. Marshall *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 216-241 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

The roles of the Space Station, as an R&D facility, as part of an industrial system which support space industralization, and as a transportation node for space operations are considered. Industrial opportunities relative to these roles are identified and space station concepts responsive to these roles are discussed. R.J.F.

N85-11037*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MICROGRAVITY CONTAINERLESS PROCESSING IN LONG DROP TUBES
R. J. Bayuzick, N. D. Evans, W. H. Hofmeister, and M. B. Robinson *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 243-259 refs Prepared in cooperation with Vanderbilt Univ., Nashville, Tenn. (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

Extensive experience in utilizing long drop tubes for studying effects of microgravity on the solidification of alloys was obtained. While some modifications are necessary to improve versatility, the facility proved to be most useful. Both an electron beam furnace and an electromagnetic levitation furnace can be used. The electron beam furnace is used with vacuum environments (0.00001 torr), whereas the levitation furnace is presently used only in inert gas environments (above 100 torr). Experiments are best applied to refractory alloys because of the sensitivity of the detectors now being used to observe solidification. Processing of lower melting point metals and alloys simply cannot be recorded. On the other hand, expected improvements in detector sensitivity will allow experimentation with relatively low melting alloys. In such cases, solidification will occur in flight only if higher inert gas pressure is used (100 to 760 torr) to increase heat loss by convection. Under these conditions microgravity conditions no longer apply. However, as shown by results to date, it is not microgravity as such that is important in drop tube solidification. Instead it is the containerless nature of the process that is significant, leading to large degrees of undercooling before solidification and therefore to unique alloys. R.J.F.

N85-11038*# Teledyne Brown Engineering, Huntsville, Ala.
THE EVOLUTION OF SMALL PAYLOAD CARRIER SYSTEMS **c18**
C. G. Breaux *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 260-271 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

The design of a bridge-like structure to span the Space Shuttle cargo bay but occupy only 3 feet of its length is discussed. The new structure was named the Missions Peculiar Equipment Support Structure (MPESS). The basic design requirements were as follows: to serve as support structure for small number of experiments; to occupy the minimal length of cargo bay; to have a standard interface hole pattern; to provide support at an elevated position; to employ standard Spacelab pallet trunnion; and to ensure natural frequency between the STS liftoff and landing frequency. The bridge-like structure is a riveted and bolted truss with machind end fittings which interface with the Spacelab trunnions. The structure is fabricated from aluminum alloy and assembled with stainless steel fasteners. R.J.F.

N85-11039*# Wyle Labs., Inc., Huntsville, Ala.
COMMERCIAL SPACE SERVICES
David L. Christensen *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 272-274 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

An overview of space service opportunities as identified by a Wyle Laboratories' research team is given. Through the use of a baseline space scenario, a variety of space hardware, services, and commercial activities are identified and related on a time-phased basis. A model is presented to relate the potential functions of government and the private sector in a commercialized space environment during the period 1984 to 2004. Barriers, incentives and key issues are likewise identified and addressed to aid in the implementation of private sector activities for spacerelated programs. Broader awareness, legislative actions, incentive development and benefit analyses are considered in the presentation. The time-phased plan provides a useful planning and management tool, allows broader communication, and supports overall space commercialization program assessment. R.J.F.

N85-11040*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DIRECTIONAL SOLIDIFICATION OF FLAKE AND NODULAR CAST IRON DURING KC-135 LOW-G MANEUVERS c26
Peter A. Curreri, D. M. Stefanescu (Alabama Univ., University), and J. C. Hendrix (Alabama Univ., University) *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 275-291 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11F

Alloys solidified in a low-gravity environment can, due to the elimination of sedimentation and convection, form unique and often desirable microstructures. One method of studying the effects of low-gravity (low-g) on alloy solidification was the use of the NASA KC-135 aircraft flying repetitive low-g maneuvers. Each maneuver gives from 20 to 30 seconds of low-g which is between about 0.1 and 0.001 gravity. A directional solidification furnace was used to study the behavior of off eutectic composition case irons in a low-g environment. The solidification interface of hypereutectic flake and spheroidal graphite case irons was slowly advanced through a rod sample, 5 mm in diameter. Controlled solidification was continued through a number of aircraft parabolas. The known solidification rate of the sample was then correlated with accelerometer data to determine the gravity level during solidification for any location of the sample. The thermal gradient and solidification rate were controlled independently. Samples run on the KC-135 aircraft exhibited bands of coarser graphite or of larger nodules usually corresponding to the regions solidified under low-g. Samples containing high phosphorous (used in order to determine the eutectic cell) exhibited larger eutectic cells in the low-g zone, followed by a band of coarser graphite. R.J.F.

N85-11041*# Alabama Space and Rocket Center, Huntsville.
PROJECT EXPLORER Abstract Only
Konrad K. Dannenberg, Arthur Henderson (Clarkson Coll., N.Y.), Jonathan Lee (Alabama Univ., Huntsville), Guy Smith (Alabama Univ., Huntsville), and Ed Stluka (Marshall Amateur Radio Club, Huntsville, Ala.) *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 292 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

PROJECT EXPLORER is a program that will fly student-developed experiments onboard the Space Shuttle in NASA's Get-Away Special (GAS) containers. The program is co-sponsored by the Alabama Space and Rocket Center, the Alabama-Mississippi Section of the American Institute of Aeronautics and Astronautics, Alabama A&M University and requires extensive support by the University of Alabama in Huntsville. A unique feature of this project will demonstrate transmissions to ground stations on amateur radio frequencies in English language. Experiments Nos. 1, 2, and 3 use the microgravity of space flight to study the solidification of lead-antimony and aluminum-copper alloys, the growth of potassium-tetracyanoplatinate hydrate crystals in an aqueous solution, and the germination of radish seeds. Flight results will be compared with Earth-based data. Experiment No. 4 features radio transmission and will also provide timing for the start of all other experiments. A microprocessor will obtain real-time data from all experiments as well as temperature and pressure measurements taken inside the canister. These data will be transmitted on previously announced amateur radio frequencies after they have been converted into the English language by a digitalker for general reception.
Author

N85-11042*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTAINERLESS DROP TUBE SOLIDIFICATION AND GRAIN REFINEMENT OF NiAl3 c26
Edwin C. Ethridge, Peter A. Curreri, Michael Kelly (Du Pont de Nemours (E. I.) and Co., Wilmington, Del.), Gary Workman (Alabama Univ., Huntsville), Anita Mobely Smith (Alabama Univ., Huntsville), and Robert Bond (Alabama Univ., Huntsville) *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 293-303 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11F

The possibility of undercooling Ni-Al alloys below the liquidus in order to produce a single phase peritectic structure by containerless drop tube solidification was studied. Containerless process is a technique for both high purity contamination free studies as well as for investigating the undercooling and rapid solidification of alloys by suppression of heterogeneous nucleation on container walls. In order to achieve large undercoolings one must avoid heterogeneous nucleation of crystallization. It was shown that the Marshall Space Flight Center drop tubes ae unique facilities for containerless solidification experiments and large undercoolings are possible with some alloys. The original goal of undercooling the liquid metal well below the liquidus to the peritectic temperature during containerless free to form primarily NiAl3 was achieved. The microstructures were interesting from another point of view. The microstructure from small diameter samples is greatly refined. Small dendrite arm spacings such as these could greatly facilitate the annealing and solid state transformation of the alloy to nearly 10% NiAl3 by reducing the distance over which diffusion needs to occur. This could minimize annealing time and might make it economically feasible to produce NiAl3 alloy. R.J.F.

N85-11043*# Alabama Univ., Huntsville. Dept. of Chemistry.
PURIFICATION OF BIOMATERIALS BY PHASE PARTITIONING Abstract Only
J. Milton Harris *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 304 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

A technique which is particularly suited to microgravity environments and which is potentially more powerful than electrophoresis is phase partitioning. Phase partitioning is purification by partitioning between the two immiscible aqueous layers formed by solution of the polymers poly(ethylene glycol) and dextran in water. This technique proved to be very useful for separations in one-g but is limited for cells because the cells are more dense than the phase solutions thus tend to sediment to the bottom of the container before reaching equilibrium with the preferred phase. There are three phases to work in this area: synthesis of new polymers for affinity phase partitioning; development of automated apparatus for ground-based separations; and design of apparatus for performing simple phase partitioning space experiments, including examination of mechanisms for separating phases in the absence of gravity. R.J.F.

N85-11044*# Grumman Aerospace Corp., Bethpage, N.Y.
DEVELOPING COMMERCIAL USERS OF SPACE Abstract Only
Louis H. Hemmerdinger *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 305 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

The use of low gravity in the development of new products is examined. Low gravity fundaments are presented clearly and simply. A display of past low gravity experiments highlights some of these precepts which are followed by a description of where and how the commercial user can fly his experiment or process. M.A.C.

N85-11045*# Universities Space Research Association, Huntsville, Ala.
CRITICAL POINT WETTING DROP TOWER EXPERIMENT
William F. Kaukler, L. M. Tcherneshoff (Alabama Univ., Huntsville), and S. R. Straits (Alabama Univ., Huntsville) *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 306-319 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

Preliminary results for the Critical Point Wetting CPW Drop Tower Experiment are produced with immiscible systems. Much of the observed phenomena conformed to the anticipated behavior. More drops will be needed to test the CPW theory with these immiscible systems. M.A.C.

N85-11046*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLIDIFICATION AND CRYSTAL GROWTH OF SOLID SOLUTION SEMICONDUCTING ALLOYS Abstract Only c76
S. L. Lehoczky and F. R. Szofran *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 320 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 20B

Problems associated with the solidification and crytal growth of solid-solution semiconducting alloy crystals in a terrestrial environment are described. A detailed description is given of the results for the growth of mercury cadmium telluride (HgCdTe) alloy crystals by directional solidification, because of their considerable technological importance. A series of HgCdTe alloy crystals are grown from pseudobinary melts by a vertical Bridgman method using a wide range of growth rates and thermal conditions. Precision measurements are performed to establish compositional profiles for the crystals. The compositional variations are related to compositional variations in the melts that can result from two-dimensional diffusion or density gradient driven flow effects ahead of the growth interface. These effects are discussed in terms of the alloy phase equilibrium properties, the recent high temperature thermophysical data for the alloys and the highly unusual heat transfer characteristics of the alloy/ampule/furnace system that may readily lead to double diffusive convective flows in a gravitational environment. M.A.C.

N85-11047*# Corning Glass Works, N.Y.
INORGANIC COMPOSITES FOR SPACE APPLICATIONS c24
J. W. Malmendier *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 321-332 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11D

The development of inorganic composite materials for space applications is reviewed. The composites do not contain any organic materials, and therefore, are not subject to degradation by ultraviolet radiation, volatilization of constituents, or embrittlement at low temperatures. The composites consist of glass, glass/ceramics or ceramic matrices, reinforced by refractory whiskers or fibers. Such composites have the low thermal expansion, refractories, chemical stability and other desirable properties usually associated with the matrix materials. The composites also have a degree of toughness which is extraordinary for refractory inorganic materials. M.A.C.

N85-11048*# Rockwell International Corp., Huntsville, Ala. Space Transportation and Systems Group.
FLUIDS EXPERIMENT APPARATUS (FEA) c35
Mike Martin *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 333-341 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 14B

The Fluids Experiment Apparatus FEA is a modular zero gravity chemistry/physics laboratory to support fundamental space processing research. It can be used to conduct basic and applied process or product experiments in general liquid chemistry, crystal growth, fluid mechanics, thermodynamics, and cell culturing. The various FEA subsystems are readily configured to perform a wide range of investigations. M.A.C.

N85-11049*# Orbital Sciences Corp., Vienna, Va.
COMMERCIALIZING THE TRANSFER ORBIT STAGE
Michael W. Miller *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 342-347 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

Key milestones necessary to establish the transfer orbit stage are examined. The selection of the project concept and synthesis of the company are described followed by an analysis venture capability support and the selection of a major aerospace company as prime contractor. A landmark agreement with NASA sanctioned the commercial TOS concept and provided the critical support necessary to raise the next round of venture capital. Project management and customer commitments are also discussed. M.A.C.

N85-11050*# Martin Marietta Aerospace, New Orleans, La.
EXTERNAL TANK AFT CARGO CARRIER Abstract Only c16
Thomas B. Mobley *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 348 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

The External Tank (ET) Aft Cargo Carrier (ACC) is a low cost, low risk augmentation of the Space Transportation System (STS). It almost doubles the cargo volume of the STS while minimally impacting other STS elements (orbiter, ET and solid rocket boosters [SRBs], launch facilities and STS operations. In addition to increasing the potential volume of cargo carried on a Shuttle launch, the ACC provides the following additional benefits: (1) Increased STS competitiveness for payloads; (2) Increased cargo manifest flexibility; (3) Increased spacecraft design options; (4) Alternate manifesting for special payloads; and (5) Future space platform/station design options. Author

N85-11051*# Morton Thiokol, Brigham City, Utah.
A PROOF-OF-PRINCIPLE GETAWAY SPECIAL FREE-FLYING SATELLITE DEMONSTRATION Abstract Only c15
R. Gilbert Moore *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 349 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

An air traffic control radar calibration satellite is described that will be used by the U.S. Federal Aviation Administration, U.S. military agencies and cooperating governments around the world to measure antenna patterns associated with the existing international air traffic control network. The satellite will employ three L-band receivers, a UHF command receiver, a VHF telemetry transmitter, associated antennas, a microprocessor, fixed solar arrays, and a power supply to acquire, store and forward signal strength data from some of the tracking radars. A second satellite is planned for launch in 1986 into a high altitude polar orbit with a lifetime of several years in order to provide a long-lived calibration service to the entire international air traffic control system. The initial satellite and associated ground station are being designed and built by a volunteer consortium of three educational institutions and more than a dozen aerospace companies. Following this initial demonstration of a free-flying Getaway Special satellite, a substantial number of organizations are contemplating commercial uses of the concept. Discussions are being held with NASA concerning the establishing of an appropriate fee for this new class of service. M.A.C.

N85-11052*# SRI International Corp., Arlington, Va.
SPACE COMMERCIALIZATION: ANALYSIS OF R AND D

INVESTMENTS WITH LONG TIME HORIZONS
Thomas P. Sheahen *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 350-361 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

By following a single hypothetical example through a series of variations, the way different potential investors might look at the opportunity to participate in space commercialization is described. The example itself is fairly typical of commercial opportunities in space. The chief characteristics are a steadily increasing requirement for capital infusion over an 8 year period, followed by a very generous stream of profits running another decade or more beyond. There is a decision point at 3 years, at the conclusion of laboratory R&D; and another at 6 years, following 2 initial space flights. M.A.C.

N85-11053*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DESIGN AND IMPLEMENTATION OF A LOW-GRAVITY SOLIDIFICATION EXPERIMENT PACKAGE FOR THE F-104
G. Smith, R. Mead, R. Bond, G. L. Workman, and Peter A. Curreri *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 362-367 Prepared in cooperation with Alabama Univ., Huntsville (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

The use of the F-104 Interceptor for low gravity materials processing experiments is extended to include alloy solidification studies above 1000 C. The F-104 can provide up to 60 seconds of low gravity, but requires a unique experiment package for integration into the aircraft, both physically and electronically. The current research with the F-104 experimental furnace system which has been used to process cast iron samples is described. Results demonstrate the capability of the facility and its operation. M.A.C.

N85-11054*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADVANCES IN ELECTROPHORETIC SEPARATIONS Abstract Only c25
R. S. Snyder and P. H. Rhodes *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 368 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 07D

Free fluid electrophoresis is described using laboratory and space experiments combined with extensive mathematical modeling. Buoyancy driven convective flows due to thermal and concentration gradients are absent in the reduced gravity environment of space. The elimination of convection in weightlessness offers possible improvements in electrophoresis and other separation methods which occur in fluid media. The mathematical modeling suggests new ways of doing electrophoresis in space and explains various phenomena observed during past experiments. The extent to which ground based separation techniques are limited by gravity induced convection is investigated and space experiments are designed to evaluate specific characteristics of the fluid/particle environment. A series of experiments are proposed that require weightlessness and apparatus is developed that can be used to carry out these experiments in the near future. M.A.C.

N85-11055*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPPORTUNITIES FOR COMMERCIAL ORGANIZATIONS Abstract Only c81
William K. Vardaman, Harry Atkins, and Kenneth R. Taylor *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 369 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

The possible applications of technology of materials processing in low gravity is discussed. A special office established by NASA to familiarize commercial organizations with materials processing in low gravity is described. This office provides information on present research and will, if requested, hold a seminar to present the technological and business aspects of joint investigations and joint endeavors to interested organizations. Arrangements can be made for visits to laboratories where ground based research is in progress. M.A.C.

N85-11056*# TRW Space Technology Labs., Redondo Beach, Calif.
SATELLITE SERVICING: A BUSINESS OPPORTUNITY? Abstract Only c81
Robert E. Wong and Elnathan H. Medler *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 370 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

The possibilities of satellite servicing as a business opportunity are examined. The service rate which a user must be charged to yield a reasonable return is derived and then compared against the market's willingness to pay that rate. Steps taken to provide the basis from which the service rate could be derived include: (1) constructing a hypothetical on orbit servicing business offering both on orbit and associated ground services; (2) estimating the total on orbit service business potential by analyzing mission models to the year 2000; and (3) setting up ground rules to bound the conduct of the business. Using this basic information service demand (business volume) cost to set up the business, costs for operation and maintenance tax rates and desired rate of return are estimated to determine the user charge. Sensitivity of the service rate to various parameters are also assessed. The time span for the business venture runs from 1986 through 2000 with service to 1991 provided via the orbiter and by a space station beyond 1991. This point analysis shows about five years of negative cash flow, with steady profits thereafter. M.A.C.

N85-11057*# Booz-Allen and Hamilton, Inc., Arlington, Va.
DOING BUSINESS IN SPACE: HOW TO GET THERE FROM HERE c81
Peter W. Wood and Peter M. Stark *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 371-382 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

A step by step process is described through which an existing enterprise or an entrepreneurial venture can initiate and carry out a new space venture. Throughout this process the business and technical aspects must be advanced in parallel with each other. Each depends on the other for its continued success, and companies may be unable to complete the venture if one or the other is neglected. The existing NASA programs and the experience of early trailblazers provide sufficient examples and opportunities for other firms to undertake new ventures with confidence. With the introduction of NASA's Commercial Space Policy, both the opportunities and the ease with which ventures can be carried out should increase significantly. M.A.C.

N85-11058# Committee on Science and Technology (U. S. House).
INITIATIVES TO PROMOTE SPACE COMMERCIALIZATION
Washington GPO 1984 76 p Hearing before the Subcomm. on Sci. and Technol., 98th Congr., 2d Sess., No. 108, 19 Jun. 1984 (GPO-37-551) Avail: Subcommittee on Space Science and Applications

NASA activities for the commercial use of space are discussed. Space shuttle payloads, space commercialization plans, government/industry relations, recommendations, economic incentives, finance, and risks are among the topics discussed. For individual titles, see N85-11059 through N85-11059. R.J.F.

N85-11059# Committee on Science and Technology (U. S. House).
STATEMENT OF HON. JAMES M. BEGGS, ADMINISTRATOR, NASA, WASHINGTON, DC
In its Initiatives to Promote Space Commercialization 1984 p 12-26 (For primary document see N85-11058 02-12)
Avail: Subcommittee on Space Science and Applications

NASA activities for the commercial use of space are discussed. Space shuttle payloads, space commercialization plans, launch costs, and government/industry cooperation are among the topics discussed. R.J.F.

N85-11060# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
26 Oct. 1984 142 p refs Transl. into ENGLISH from various Russian articles
(JPRS-USP-84-005) Avail: NTIS HC A07

Highlights of work completed aboard the U.S.S.R. Salyut-7 and the progress-21,22 spacecraft are reported. In the area of space sciences, subject matter covered includes: (1) nonlinear oscillations of two body system in elliptical orbit; (2) convection of plasma in polar ionosphere; (3) atmospheric ozone model; and (4) statistical analysis of 11-year and 80-year solar cycles. In the area of interplanetary science, the Venusian atmosphere is discussed. The development of spacecraft instrumentation is discussed. In the area of space applications, of interest includes: (1) space research benefits to economy; (2) statistical characteristics of atmospheric optical thickness in visible spectral range; (3) soil cover interpretation method; (4) space observation of latitudinal changes in vegetation cover; and (5) seismotectonic nature of some annular photo anomalies registed by remote methods. For individual titles, see N85-11061 through N85-11120.

N85-11061# Joint Publications Research Service, Arlington, Va.
FEATURES AND USES OF PROGRESS CARGO SHIPS Abstract Only **c18**
M. Chernyshov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 1 Transl. into ENGLISH from Turkmenskaya Iskra (USSR), 19 Jun. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

General information is provided on the role and capabilities of automatic cargo spaceships of the Progress series. The Progress ship is said to be essentially a Soyuz spacecraft with all of its manned flight equipment removed and automatic control systems added. The type of cargo it carries can be changed to meet current requirements. B.W.

N85-11062# Joint Publications Research Service, Arlington, Va.
FEATURES OF NEW SOLAR PANELS ON SALYUT-7 Abstract Only **c44**
G. Lomanov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 2 Transl. into ENGLISH from Sotsialisticheskaya Ind. (Moscow), 20 May 1984 p 4 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Extra panels on a solar bettery of the orbiting station Salyut-7 were installed. Features and capabilities of these panels are discussed. B.W.

N85-11063# Joint Publications Research Service, Arlington, Va.
TASS REPORTS LAUNCH OF PROGRESS-22 Abstract Only **c18**
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 6 Transl. into ENGLISH from Pravda (Moscow), 29 May 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The launching of the automatic cargo ship Progress 22 is described. The purpose of the ship's launching is to deliver materials that are subject to depletion and various cargo items to the orbiting station. B.W.

N85-11064# Joint Publications Research Service, Arlington, Va.
PROGRESS-22 DOCKS WITH SALYUT-7 Abstract Only **c18**
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 7 Transl. into ENGLISH from Sovetskaya Rossiya (Moscow), 31 May 1984 p 2 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The automatic docking of the cargo ship Progress-22 with the manned orbiting complex Salyut-7 -- Soyuz T-11 was accomplished. The mutual search, rendezvousing, approach and docking of the spacecraft were executed using onboard automation. These procedures were monitored by the Flight Control Center and by the crew of the orbiting complex. The cargo ship was docked to the station. The Progress-22 ship delivered into orbit fuel for the station's combined engine assembly, equipment, instruments, and materials for scientific research. B.W.

N85-11065# Joint Publications Research Service, Arlington, Va.
COSMONAUTS COMPLETE 4TH MONTH ABOARD SALYUT-7 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 10-11 Transl. into ENGLISH from Rabochaya Gazeta (Moscow), 9 Jun. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The fourth month of work aboard Salyut-7 in near earth orbit included geophysical and astrophysical experiments, medical research and the unloading of the transport spaceship. In line with the extensive program of research of the Earth's natural resources and study of the environment, the cosmonauts performed several series of visual observations and photography of various regions of the territory of the Soviet Union and the waters of the world's oceans. Several medical examinations were performed for the purpose of evaluating the state of the cosmonauts' health and working fitness. Data were obtained on the condition of their cardiovascular systems, the effectiveness of various physical conditioning exercises which the crew is performing regularly, and features of carbohydrate and mineral metabolism in humans who are in space flight conditions for prolonged periods of time. B.W.

N85-11066# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL EXPERIMENTS, PHOTOGRAPHY ABOARD SALYUT-7 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 12 Transl. into ENGLISH from Pravda (Moscow), 16 Jun. 1984 p 4 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Studies of the Earth's surface, experiments for the study of its atmosphere and ionosphere, and the perfecting of celestial orientation methods and equipment were completed by the crew of the Salyut-7. Together with the scientific research, the cosmonauts did a large amount of work on unloading the transport spaceship Progress-22. Equipment and apparatus that had been delivered were installed in their permanent places by the cosmonauts, and they replaced a group of chemical storage batteries on board the station. B.W.

N85-11067# Joint Publications Research Service, Arlington, Va.
ORBIT OF SALYUT-7 STATION BOOSTED Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 13 Transl. into ENGLISH from Sotsialisticheskaya Ind. (Moscow), 23 Jun. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

In line with the extensive program of geophysical experiments, the cosmonauts performed several series of observations, photography and spectrometry of the Earth's land and waters of the world's oceans aboard the Salyut-7 in their 135th day of work in orbit. Preparations have begun for refueling the station's combined engine assembly with fuel delivered by the Progress-22 spaceship. A correction of the orbit of the scientific research complex was made using the cargo ship's engine. B.W.

N85-11068# Joint Publications Research Service, Arlington, Va.
SALYUT-7 CREW IN ORBIT 150 DAYS Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 15 Transl. into ENGLISH from Gudok (Moscow), 7 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The progress of the crew aboard the Salyut-7 in their 150th day of work in near-Earth orbit is reported. Astrophysical and geophysical experiments, medical examinations and technical experiments were conducted on board the manned complex Salyut-7 -- Soyuz T-11 -- Progress-22. In line with the program for study of the Earth's natural resources and environment, several series of photography of the territory of the Soviet Union and the waters of the world's oceans were carried out. The Caspian lowlands, mountain areas of the Central Asian republics, the Transbaykal region and the Maritime Kray were selected as areas

for photography. Medical monitoring was aimed at obtaining additional data on the condition of the cardiovascular system of cosmonauts during prolonged space flight. In accordance with the station's refueling schedule, fuel was pumped from the tank of the Progress-22 cargo spaceship into the fuel tanks of the combined engine assembly. B.W.

N85-11069# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON COSMONAUTS GEOLOGICAL MAPPING, PHOTOGRAPHY Abstract Only **c43**
B. Mozhayev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 16 Transl. into ENGLISH from Pravda (Moscow), 12 Jul. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The work of geological mapping of the Earth from a spacecraft is discussed. Comments are made in particular on methods and equipment which crews of Salyut orbiting stations have used in this work. B.W.

N85-11070# Joint Publications Research Service, Arlington, Va.
TASS REPORTS LAUNCH OF SOYUZ T-12 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 19 Transl. into ENGLISH from Sotstalisticheskaya Ind. (Moscow), 18 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

In accordance with the program of research of outer space, the spaceship Soyuz T-12 was launched from the Soviet Union on July 17, 1984. The ship's flight program calls for docking with the orbiting complex Salyut-7 -- Soyuz T-11. Scientific and technical research and experiments are performed aboard the manned complex. The onboard systems of the Soyuz T-12 spaceship are functioning normally. The crew of the Soyuz T-12 spaceship has begun carrying out the designed flight program. B.W.

N85-11071# Joint Publications Research Service, Arlington, Va.
TASS REPORTS MEDICAL, MATERIALS STUDIES ABOARD SALYUT-7 Abstract Only **c52**
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 24 Transl. into ENGLISH from Pravda (Moscow), 21 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The spaceship 'Soyuz T-12' docked with the orbiting complex 'Salyut-7'--'Soyuz T-11', which is piloted by a crew of three cosmonauts. After checking the seal of the docking mechanism, three cosmonauts, went inside the 'Salyut-7' station. Six Soviet cosmonauts, including a woman, are working in near Earth space on board the scientific resarch complex 'Salyut-7'--'Soyuz T-11'--'Soyuz T-12'. The program of the joint mission calls for technical and technological experiments, observations of photography of the Earth's surface, and medical-biological, astrophysical and other studies. According to telemetry data, the onboard systems of the scientific research complex 'Salyut-7'--:Soyuz T-11'--'Soyuz T-12 are functioning normally. Author

N85-11072# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON SALYUT-7 ELECTROPHORESIS, PLUGGING MORTAR EXPERIMENTS Abstract Only **c25**
V. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 25 Transl. into ENGLISH from Pravda (Moscow), 21 Jul. 1984 p 6 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Information on two experiments which were scheduled on the orbiting station 'Salyut-7'. One experiment is aimed at obtaining extra pure substances as a basis for the semi-industrial production of certain drugs. In the experiment, a protein solution is pumped into a special container, an electric field is turned on, and the protein separates into four fractions. Enough preparation to last a research institute a month can be obtained in a few hours. Preparations obtained in space are 15 to 20 times as pure as those produced on Earth. Another experiment was performed on the problem of reducing losses of oil and gas during well-drilling. It is explained that oil and gas under pressure seep through pores in the plugging mortar which fills the space between the casing pipe of the borehole and the ground. Three cubes were obtained from three different types of mortar. The purpose of this experiment is to help ascertain how the process of pore formation proceeds in mortar and whether a relationship exists between this process and the settling of particles. Author

N85-11073# Joint Publications Research Service, Arlington, Va.
TASS REPORTS EXPERIMENTS DURING VISITING CREW'S THIRD DAY Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 26-27 Transl. into ENGLISH from Pravda (Moscow), 22 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Technological and medical-biological experiments were visual observations of the Earth's surface, and still and motion-picture photography of joint work. Work broad on separating biological preparations in an electric field. The purpose of this work was to obtain experimental lots of superpure substances and effective new medicinal preparations in conditions of zero gravity. An anti-infectious preparation obtained by a genetic engineering method is being purified in one of this unit's electrophoretic chambers today. An experiment for determining how open space affects various structural materials was performed. Speciments under study were exposed in a depressurized airlock chamber, and their condition was monitored. A biological experiment was to study the effect of space flight factors on the permeability of the cell membranes of microorganisms and on other characteristics of their vital activity was continued. Author

N85-11074# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON DERIVATION OF BIOLOGICAL MATERIALS, COSMONAUT ADAPTATION Abstract Only **c51**
A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 28-29 Transl. into ENGLISH from Izv. (Moscow), 22 Jul. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The latest series of medical and biological experiments which were scheduled for performance on board the orbiting station 'Salyut-7' are discussed. The progress of experiments for obtaining superpure substances have convinced specialists that it is both possible and economically advantageous to obtain, in space, superpure biological preparations in quantities sufficient for practical employment in public health and agriculture. An extrapure antiserum which is now being used as a standard in the production of standard vaccines was manufactured with the aid of a spaceborne preparation. This preparation was obtained from the membrane of the influenza virus. A small portion of this substance will be used to obtain so called diagnosticums for the routine determination of viral strains that cause epidemics at particular times. Work aimed at isolating microorganisms which are efficient producers of fodder antibiotics, and at obtaining certain medical preparations which are free of undesirable impurities is being performanced. A valuable medicinal protein is to be refined from a preparation obtained on Earth by a genetic engineering method. Author

N85-11075# Joint Publications Research Service, Arlington, Va.
TASS REPORTS ASTROPHYSICAL, ATMOSPHERIC STUDIES ON SALYUT-7 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 32 Transl. into ENGLISH from Pravda (Moscow), 24 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

An extensive set of medical examinations were conducted. Their results showed that the process of adaptation to zero gravity is proceeding well. In line with the program of astrophysical studies, the distribution of interplanetary matter in space was examined. The density of aerosol layers of cosmic origin in the Earth's atmosphere was also studied. The experiment was being performed with the EFO-1 photoelectric photometer. It consisted of measuring the change in brightness of stars as they set behind the atmosphere and thereby getting a cross section of the layer of aerosols. Author

N85-11076# Joint Publications Research Service, Arlington, Va.
EVA OF COSMONAUTS SAVITSKAYA AND DZHANIBEKOV Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 38-39 Transl. into ENGLISH from Komsomolskaya Pravda (Moscow), 27 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

In line with the flight program of the orbiting scientific research complex 'Salyut-7'–'Soyuz T-11'–'Soyuz T-12', egress was made into open space. The main task of this egress was to conduct tests of a new multipurpose hand tool which is intended for the performance of complex technological operations. In the entry compartment, a portable electron beam unit, a control desk, a converter and boards holding specimens of metal was set up and prepared for operation. With the aid of the multipurpose hand tool, operations for cutting, welding and soldering metalplates, and spray-coating operations were performed. During the final stage of the egress panels that had been installed previously on the outer surface of the station were dismantled and took inside. These panels contained various structural materials which had een in conditions of open space for a long time. While the work in open space was in progress, the functioning of systems of the station and of space suits was monitored and radio communication was maintained. Author

N85-11077# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON HAND TOOL USED IN COSMONAUT EVA Abstract Only **c37**
G. Lomanov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 40 Transl. into ENGLISH from Sotsialitsicheskaya Ind. (Moscow), 27 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Information on equipment which was used to perform welding and spary-coating experiments during egress from the orbiting station 'Salyut-7' is discussed. A variant of a multipurpose hand tool (URI) for space installations was employed in the experiments. The tools development was made possible by metal vaporization and deposition experiments performed during earlier space missions. A manual device for use in open space was developed on the basis of an electron beam gun. A variant of this device was successfully tested in a laboratory airplane, during brief periods of zero gravity. The URI employed is said to be part of a small unit including coverters and a control system. This unit can be fastened with clamps to handrails of the 'Salyut-7' station. On one side of the unit are four folding, board-type holders for specimens. The URI, which is connected to the unit by a cable, resembles a hand-held camera with two lens barrels. One is intended for cutting, welding and soldering metals; the other for applying coatings. Author

N85-11078# Joint Publications Research Service, Arlington, Va.
FURTHER DETAILS IN WELDING, SPRAY-COATING TOOL Abstract Only **c37**
A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 41 Transl. into ENGLISH from Ivz. (Moscow), 27 Jul. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

An account of activities on board the orbiting station 'Salyut-7' during the recent egress into open space is given. The welding and spray coating operations which was performed outside the station with the aid of a multipurpose hand tool (URI) is discussed. The entire URI unit is said to appear capable of fitting into a box half a meter square. The main part of this unit somewhat resembles a flare pistol with two broad barrels, one of which has a lens on it. A powerful electron beam generated inside this barrel is focused, with the aid of the lens, onto metal specimens of various shapes, which are cut, welded or soldered by means of the beam. The second barrel is intended for spray coating other specimens with silver. This barrel has a built in crucible for melting the silver. During the welding of several specimens in succession, the temperature of their holders was monitored with the aid of a pistol shaped, noncontact infrared thermometer. Author

N85-11079# Joint Publications Research Service, Arlington, Va.
THE BELIKT EXPERIMENT **c15**
I. A. Strukov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 46-56 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 4, Jul-Aug. 1984 p 5-12 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The experiment in which the smallest radio telescope in near space carried by a high apogee 'Prognoz-9' satellite is discussed and its reception of an uninterrupted microwave background radiation. By studying the distribution of the background radiation's radiobrightness temperature, the development of separate parts and fragments of the universe is analyzed, along with the solar system's direction and velocity relative to the background radiation. It is concluded that the main achievement of the experiment is the functioning of the radio telescope. E.R.

N85-11080# Joint Publications Research Service, Arlington, Va.
PERIODIC OSCILLATION OF GYROSTAT-SATELLITE ABOUT ITS CENTER OF MASS IN AN ELLIPTICAL ORBIT Abstract Only **c13**
V. V. Sazonov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 60 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 147-158 Original language document was announced as A84-34076 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The motion of a satellite gyrostat with respect to the center of mass under the effect of a gravity moment in a Keplerian elliptical orbit is analyzed. The motion is described by a system of ordinary differential equations of sixth order with periodic coefficients. It is assumed that the intrinsic kinetic moment of the gyrostat is large and that the system of equations of motion contains a large parameter. An attempt is made to find symmetric periodic solutions to this system which are close to periodic solutions to a corresponding fourth-order degenerate system. The unknown solutions are obtained in series in negative powers of the large parameter, and are investigated numerically. B.J.

N85-11081# Joint Publications Research Service, Arlington, Va.
PLANNING OF NAVIGATION MEASUREMENTS USING TD CRITERION FOR DETERMINATION OF MOVEMENT OF SPACECRAFT BY METHOD OF LEAST SQUARES Abstract Only **c18**
M. P. Nevolko, I. S. Drobin, and L. Yu. Belousov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 60-61 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 159-164 Original language doc. was announced as A84-34077 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The Belousov (1982) multitarget-planning method is used to determine and predict the motion of spacecraft in almost-circular (H = 1000 km) orbits, with the least-squares method employed for data processing. The accuracy of motion prediction when the entire set of measurements is processed is compared to the accuracy achieved when only a sample of measurements obtained with the multitarget-planning method is processed. It is concluded that the multitarget-planning method, based on the arbitrary correlation of measurement and model errors, is effective as a rule for determining the program of navigation measurements to be processed by the least-squares method. B.J.

N85-11082# Joint Publications Research Service, Arlington, Va.
NONLINEAR OSCILLATIONS OF 2 BODY SYSTEM RELATIVE TO CENTER OF MASS IN ELLIPTICAL ORBIT Abstract Only **c13**
V. I. Gulyayev, P. P. Lizunov, and N. N. Produenko *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 61 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 165-170 (For primary document see N85-11060 02-12)

Avail: NTIS HC A07

A study is made of a system of two bodies connected by elastic couplings. The center of mass moves in a gravitational field in an elliptical Keppler orbit. The method of continuing a solution with respect to a parameter is used to construct a periodic solution to the nonlinear differential equations of motion of the system. The influence of the attached mass of the system and relationships between main central moments of inertia on stability and form of relative motion are studied. It is found that a change in inertial parameters of the system has a significant influence on the stability and form of oscillations. Increasing attached mass leads to destabilization of the motion of the system in most cases. Author

N85-11083# Joint Publications Research Service, Arlington, Va.
RAPID NONRESONANT ROTATION OF A SPACECRAFT IN NOMINALLY PERIODIC ORBITS IN LIMITED 3 BODY PROBLEM Abstract Only **c18**
P. S. Krasilnikov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 62 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 171-180 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Rapid nonresonant rotations of a satellite in an arbitrary nominally periodic orbit in the elliptical which limited three body problem based on partial averaging of the Hamiltonian of the system were studied. Gravitational moments cause evolution of kinetic energy of the undisturbed relative motion of the satellite. The generalized elliptical problem of three bodies, two of which are bodies with spherical distribution of mass moving relative to each other in an elliptical Keppler orbit, while the third is a satellite of negligible mass with an arbitrary ellipsoid of inertia were analyzed. The equations describe the rotation of a spacecraft in any nominally periodic trajectories of its center of mass computed with any degree of accuracy which considers arbitrary perturbing forces. E.A.K.

N85-11084# Joint Publications Research Service, Arlington, Va.
USE OF GRAVITATIONAL STABILIZATION IN PERFORMANCE OF EXPERIMENTS Abstract Only **c18**
M. Yu. Belyayev and T. N. Tyan *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 62 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 181-188 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Spacecraft such as the Salyut-6 use gravitational stabilization for the conduct of geophysical, astronomical and other experiments. Development of an effective strategy for controlling spacecraft in gravitational stabilization modes requires to study the specifics of motion of the spacecraft. The gravitational orientation of the station was studied by a mathematical model of motion considering the effect of gravitational, aerodynamic and magnetic disturbances, and by telemetry information from the control system of the angular position installed on the spacecraft. The true picture of motion of the spacecraft and practical recommendatins for the use of gravitational stabilization in performing scientific experiments are established. E.A.K.

N85-11085# Joint Publications Research Service, Arlington, Va.
CONTROL OF LATERAL CONJECTORY MOTION OF SPACECRAFT IN ATMOSPHERE Abstract Only **c18**
E. N. Dudar and V. A. Yaroshevskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 63 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 189-200 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The equation of motion of a spacecraft in the atmosphere has a time characteristic for the motion of the spacecraft about its center of mass which is usually significantly less than the time characteristic for the trajectory motion. In many cases, problems of optimal control of spacecraft trajectories are solved without consideration for its motion about its center of mass. The problem of control of the spatial trajectory of a spacecraft by changing the bank angle was studied. The control vector is included linearly in the right portion of the trajectory equations of motion, which can be linearized and applied to the apparatus of the theory of stochastically optical control systems. A control algorithm is suggested based on construction of areas of permissibility in the space of final parameters. Numerical examples are included. E.A.K.

N85-11086# Joint Publications Research Service, Arlington, Va.
CONVECTION OF PLASMA IN POLAR IONOSPHERE, COMPARISON OF MEASUREMENTS FROM COSMOS-184 WITH MODEL DEPENDENT ON INTERPLANETARY MAGNETIC FIELD VECTOR Abstract Only **c46**
B. A. Belov, Yu. I. Galperin, L. V. Zinin, A. Ye. Levitin, R. G. Afonina, and Ya. I. Feldshteyn *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 63 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 201-212 Original language doc. was announced as A84-34082 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

A problem arising in the construction of a polar cap plasma model is determination of the average quasisteady picture of the electric field, convection and lingitudinal currents, which are determined by factors external to the magnetosphere such as the interplanetary magnetic field, velocity and pressure of the solar wind, level of solar UV radiation, date and time. Satellite measurements are used to study the variations. A combination of various geophysical measurement methods showed certain characteristic structural elements of the unsteady field and current picture during substorms. The work uses the simplest model which is constructed on a correlation analysis of variations in the geomagnetic field with parameters of the solar wind. It is suggested that elimination of a number of simplifying assumptions would greatly increase the complexity and difficulty of using the model. E.A.K.

N85-11087# Joint Publications Research Service, Arlington, Va.
EQUATORIAL ENERGETIC DISTRIBUTIONS OF IONS OF TERRESTRIAL RADIATION BELT AS FUNCTION OF SOLAR CORONA TEMPERATURE RESPONSE Abstract Only **c46**
N. A. Vlasova and M. I. Panasyuk *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 64 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 213-224 Original language doc. was announced as A84-34083 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Differential energy spectra of H, He, c, and O ions with energies exceeding 1 MeV in the radiation belts at the geomagnetic equator in a magnetically quiet period were analyzed. It is shown that at L envelopes'of at least 4 the rigidity of the spectrum is a function of the ion charge state. It is found that the form of the ion spectrum reflects charge states characteristic for coronal temperatures of one million to two million K. This finding is used to explain the existence of dominant streams of heavy ions in the radiation belts. Author

N85-11088# Joint Publications Research Service, Arlington, Va.
HELIUM ATOMS IN INTERSTELLAR AND INTERPLANETARY MEDIA, PART 3: TEMPERATURE AND VELOCITY OF INTERSTELLAR WIND Abstract Only **c90**
V. G. Kurt, Ye. N. Mironova, Zh.-L. Berto, and F. Dalode *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 64-65 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 225-237 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The distribution of intensities over the celestial sphere in the neutral helium line ar lambda=584 A which is obtained from background radiation observations on the Prognoz-6 satellite with a 4 channel photometer was used to find the temperature and magnitude of the velocity vector of the interstellar wind. The direction of motin of the interstellar medium relative to the sun was determined from the same observations. Interaction of neutral

helium in the interstellar medium with the gravitational field of the sun and resonant scattering on intereplanetary helium are calculated. The temperature and velocity of the model which best agree with the results were determined separately for each of six measurement sessions onboard the satellite. The average temperature was 11,600 K, velocity 25.3 km/s. It is found that the mean density of helium in space near the sun is be 0.018 cm -3. E.A.K.

N85-11089# Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF CHARGED PARTICLES IN LOWER IONOSPHERE WITH ACOUSTICAL EFFECTS Abstract Only **c46**
I. A. Devyaterikov, Ye. A. Ivanov, S. I. Koslov, and V. P. Kudryavtsev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 65 Transl. into ENGLISH from Kosmicheskiye Issled (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 238-242 Original language doc. was announced as A84-34085 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The behavior of charged particles (electrons and positive and negative ions) in the D-region during the passage of weak shock and acoustic waves was studied. It is shown that under such conditions the photochemical equilibrium can be disrupted in the lower part of the D-region, which results in a condition under which the electron density does not follow the variations of neutral gas density. Author

N85-11090# Joint Publications Research Service, Arlington, Va.
PHYSICAL AND MECHANICAL PROPERTIES OF LUNAR SOIL AS FUNCTION OF SPECIFICS OF RELIEF AND PROCESSES IN VICINITY OF OPERATION OF LUNOKHOD-2 Abstract Only **c91**
A. T. Bazilevskiy, N. N. Grebennik, V. V. Gromov, A. D. Dmitriyev, A. L. Kemurdzhian, V. P. Polosukhin, P. S. Semenov, and K. P. Florenskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 65-66 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p. 243-251 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The bottom of the crater, a fault on the crater bottom and the hilly broken continental terrain to the south crater floor in the southern part of the Lemonier crater, were investigated. It is shown that the physical and mechanical properties of the lunar regolith varied with slope steepness, duration of exposure and local pecularities of relief. Photographs taken by Lunokhod-2 and lunar orbiter 4 are presented. Although there is significant variation in load bearing capacity of the lunar soil, as the steepness of the surface increases on the surface are exposed, the stronger the deposits become, all other factors are equal. It is concluded the slope process of temperature creep is very important in the formation of the pecularities of the regolith and evolution of relief. E.A.K.

N85-11091# Joint Publications Research Service, Arlington, Va.
MODEL OF ATMOSPHERIC OZONE FOR MIDDLE LATITUDES Abstract Only **c46**
V. S. Komarov and A. A. Mitsel *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 66 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 306-309 Original language doc. was announced as A84-34093 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Winter and summer midlatitude models of vertical ozone distribution are presented. These models were developed for the temperate zone of the Northern Hemisphere on the basis of recent data of the global ozonometric network and rocket observations. The models are compared with existing reference ozone models, and it is concluded that the proposed models are suitable for use as a standard in problems of atmospheric optics and the remote sensing of atmospheric characteristics. Author

N85-11092# Joint Publications Research Service, Arlington, Va.
VARIATION OF FAST CHARGED PARTICLES IN EVENT OF 22 NOVEMBER 1977 BASED ON COSMOS-900 SATELLITE DATA Abstract Only **c93**
Ye. V. Gorchakov, V. A. Iozenas, M. V. Ternovskaya, V. G. Afanasyev, and P. P. Ignatyev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 67 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 312-315 Original language document announced as A84-34095 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The Cosmos-900 satellite studied cosmic rays by a Cherenkov counter which recorded heavy particles with a charge of over 1 and energy of over 400 MeV/nucleon plus electrons with energies of over 15 MeV. A solar flare occurred on 22 Nov. 1977, which began at 9:45 a.m. and reached its maximum at 10:07 a.m. The data obtained can be used to estimate the form of the energy spectrum of the radiation recorded in the energy range from 400 to 2000 MeV. Sharp counting peaks were observed at 10:35 and 11:40 a.m. Neutron monitors do not show these sharp increases. It is possible that the maxima result from specifics of penetration of solar cosmic rays into the magnetosphere and albedo particles which arise as cosmic rays to act upon the atmosphere. E.A.K.

N85-11093# Joint Publications Research Service, Arlington, Va.
PRECIPITATION OF PROTONS WITH E SUB p APPROXIMATELY 1 MeV NEAR PLASMOPAUSE Abstract Only **c90**
P. V. Vakulov, S. N. Yemelyanenko, V. A. Kutnetsova, S. N. Kutnetsov, K. Kudela, and B. Popelyavska *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 67 Transl. into ENGLISH from Kosm. Issled. (Moscow) v. 22, no. 2, Mar. - Apr. 1984 p 315-318 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Fluxes of quasicaptured protons at L approx 3.2 during geomagnetic disturbances were observed. It is assumed that the quasicaptured protons result from the interaction of captured protons with hydromagnetic waves. It is found that the Fermi mechanism of interaction of waves and particles influence the dynamics of captured protons in the vicinity of the plasmopause where there is a well expressed trough in the distribution of the cold plasma. These conditions occurred during magnetic disturbances. It is stated that a full experiment to check the effectiveness of this scattering mechanism must include measurements of the flux and spectrum of protons plus measurements of cold plasma density and the amplitude of Alfven waves with a period of 3 to 10 seconds. E.A.K.

N85-11094# Joint Publications Research Service, Arlington, Va.
FAST HARTMANN METHOD FOR PROBLEMS IN ASTRONOMICAL ADAPTIVE OPTICS Abstract Only **c89**
T. I. Balakhovskaya, V. I. Borisenko, E. A. Vitrichenko, K. L. Maslennikov, A. M. Prokhorov, R. Z. Sagdeyev, Ye V. Trushin, and L. S. Chesalin *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 68 v. 274, no. 5, Feb. 1984 p 1057-1060 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

A Hartmann device (GRIFON) was developed for simulating the operation of the wavefront sensor of an adaptive system. This device makes it possible to account for wavefront deformation of stellar radiation due to turbulent refractive-index irregularities in the Earth's atmosphere. The effectiveness of the method is confirmed by a series of Hartmann pictures obtained with the 70-cm reflector of the Kiev observatory for stars up to 3 m.Author

N85-11095# Joint Publications Research Service, Arlington, Va.
STATISTICAL ANALYSIS OF 11-YEAR AND 80-YEAR SOLAR CYCLES Abstract Only **c92**
M. Biyelekova *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 68-69 Transl. into ENGLISH from Astron. Z. (Moscow), v. 61, no. 1, Jan. - Feb. 1984 p 163-169 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The method of linear two-parameter regression analysis was

used to process the 11-year and secular (Gleissberg) solar cycles using Wolf numbers. The 11-year cycle is a cosine curve as a rough approximation, since the cycle rises more rapidly than it droops and sometimes has two maxima. The correlation of Wolf number with a cosine curve is rather high. Results of approximation of 11-year solar cycles by generalized analysis were used as the initial material for determination of the secular cycle. Three maxima have been observed, in 1778, 1860 and 1950. Two methods were used to determine the parameters of this cycle. The 80-year cycle was statistically confirmed. Author

N85-11096# Joint Publications Research Service, Arlington, Va.
PROBLEM OF DETERMINING HIGHLY ACCURATE COORDINATES OF ARTIFICIAL SATELLITES BY PHOTOGRAPHIC METHODS Abstract Only **c13**
D. P. Duman *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 69-70 Transl. into ENGLISH from Astron. Z. (Moscow), v. 61, no. 1, Jan. - Feb. 1984 p 184-189 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Problems which must be solved by determination of highly accurate positional observations of satellites include construction of an inertial system of coordinates for radio sources and its tie-in with the inertial system of coordinates based on optical observations of the stars. Solution of this problem requires the use of angular coordinates primarily of distant satellites, whose motion is little disturbed by the influence of higher harmonics of the terrestrial gravitational field and atmosphere. The problem of determining the angular coordinates of satellites by photographic methods with great precision includes a number of independent sections. The solution requires an increase in the focal length of the lenses used in satellite cameras. Futhermore, satellite observations must be performed with fast lenses, due to the low brightness of most satellites. Third, radiation receivers should be photographic plates capable of producing images 20-30 micrometers in diameter. Fourth, an accurate catalog of stellar positions is required for tie-in of the satellite position. Finally, computers must be used to process measurement data. The most promising method of increasing the accuracy of determining the angular positions of high altitude satellites by a factor of 2 to 3 is to use wide angle astrographs with focal length at least 2 m, lens diameter at least 40 cm, made using special satellite tracking cameras with exposure time of -1,000 s. Author

N85-11097# Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF 15 RADIO GALAXIES FROM BOLOGNA SURVEY USING RATAN-600 RADIO TELESCOPE Abstract Only **c89**
V. G. Malumyan *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 P 70 Transl. into ENGLISH from Pisma V Astron. Z. (Moscow), v. 10, no. 2, Feb. 1984 p 90-93 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Results are presented from observations of 15 radio galaxies in the Bolgna survey (B2 as follows: 0055 + 26, 0222 + 36, 0331 + 39, 0722 + 30, 0836 + 29, 0844 + 31, 0916 + 34, 1040 + 31, 1101 + 38, 1141 + 37 NE, 1322 + 36, 1346 + 26, 1515 + 29 observed at 3.66 or 3.95 GHz; and B2 1350 + 31 and 1626 + 39 observed also at 0.97 and 7.69 GHz), using the RATAN-600 radio telescope. Results are shown in tabular form and discussed individually. A halo measuring 6'-7' was observed around galaxy B2 1141 + 37; anomalies in observations of this galaxy are discussed. Author

N85-11098# Joint Publications Research Service, Arlington, Va.
OBSERVATION OF GAMMA RADIATION FROM CRAB NEBULA IN 5-100 MeV RANGE Abstract Only **c93**
A. F. Iyudin, V. G. Kirillov-Ugrymov, Yu. D. Kotov, Yu. V. Smirnov, V. N. Yurov, L. V. Kurnosova, M. I. Fradkin, S. V. Damle, G. S. Gokhale, P. K. Kunte et al *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 71 refs Transl. into ENGLISH from Pisma V Astron. Z. (Moscow), v. 10, no. 2, Feb. 1984 p 100-104 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Results are presented from observations of gamma radiation from the Crab Nebula within the energy range 5-100 MeV, conducted 6-7 November 1980 using a Nataliya-1 gamma telescope in aerostat flight. The structural layout of the telescope is shown and the observation procedure is described. The observations were carried out at latitude 8 N (Hyderabad city, India) over 6-hour periods. A total of 3,700 events were registered. Data were processed in two stages: classification of events (pairs, singlets, background) and determination of track; and a determination of energy for each useful event from the value for repeat scattering of secondary charged particles and the direction of gamma quanta. Events were assigned to one of two energy ranges, viz. 5-20 MeV and 20-100 MeV. Differential fluxes were determined using parallel coordinates and a cross-correlational procedure. Differential gamma fluxes were as follows: I gamma (5-20 Mev) = 2.1 plus or minus 0.3). -100,000 gamma/square centimeters s:MeV I gamma (20-100 Mev) = 1.0 plus or minus 0.1 over 0.2). - 1,000,000 gamma/square centimeters s:MeV. Results agree quite well with earlier published findings and do not support the idea of significant excess in the range 5-20 MeV. Author

N85-11099# Joint Publications Research Service, Arlington, Va.
SOLAR FLARES AND LABORATORY EXPERIMENTS ON MAGNETIC RECONNECTION IN CURRENT SHEATHS Abstract Only **c92**
S. V. Bulanov, V. A. Dogel, and A. G. Frank *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 72 Transl. into ENGLISH from Pisma V Astron. Z. (Moscow), v. 10, no. 2, Feb. 1984 p 149-153 Document previously announced as A84-43998 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Laboratory experiments to model processes in solar flares are described, with special reference to the problem of the dynamics of highly conductive plasma in the vicinity of the particular, especially the zero line of the magnetic field. Approximation modeling is done by comparing the values characterizing the physical conditions in the active clouds of the solar corona and in the atmospheres of flare stars, and in series of laboratory experiments devoted to a study of the formation, stability and explosive disruption of current sheaths in the vicinities of zero lines of the magnetic field. Analysis of plasma flow is based on the relationship of gas kinetic pressure and magnetic pressue, the parameter for nonlinearity, and the Reynolds magnetic number, but disregarding other dissipative process. It is shown that the physical characteristics typical of the preflare situation in the Sun and in stars can be satisfactorily reproduced from the viewpoint of the buildup of magnetic energy, and hence, should correctly reproduce the main physical processes occurring during flares. Thus, there is a qualitative analogy between the main phenomena of explosive disruption of the current sheath in laboratory experiments and the pulse phase of star flares. R.J.F.

N85-11100# Joint Publications Research Service, Arlington, Va.
TWO-LEVEL MODEL FOR FORMATION OF NIGHT IONOSPHERE OF VENUS FROM RADIO OCCULATION EXPERIMENTS Abstract Only **c91**
I. K. Osmolovskiy, N. A. Savich, and L. N. Samoznayev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 76 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 276, no. 2, May 1984 p 325-328 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Although available data from radio occultation experiments (Venera-9 and Venera-10 (1975) and Pioneer and Verna stations (1978)) show that during years of low solar activity the electron concentration in the night ionosphere of Venus has two maxima (is two-level), the reasons for this were not clarified. A two-component diffusion model (0(+) and 0(+) sub 2) is proposed to describe the natural formation of the one- or two-maximum electron concentratioons as a function of physical conditions in the Venusian atmosphere. The basic idea is to find those conditions in which 0(+) plasma moves from the day side to the night side, in which

the upper maximum formed in a descending stream of 0(+) ions stops at a given maximum forming in the descending stream because of the 0(+)2 ions formed as the result of chemical reactions between the 0(+) ions and CO2 molecules. The mathematical apparatus is described. The consistency of the model is checked against typical profiles having one or two maxima. Specific experimental results are discussed in terms of electron concentration and temperature of the neutral atmosphere and the correctness of model calculations is shown. It is intended to use the model also to investigate the contribution of epithermal electrons in the formation of the Venusian night atmosphere.
R.J.F.

N85-11101# Joint Publications Research Service, Arlington, Va.
INFRARED THERMAL RADIATION OF VENUS Abstract Only c91
L. V. Ksanfomaliti *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Jan. 1984 p 77 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 252-266 Original language document announced as A84-34087 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07/MF A01

Data on the characteristics of the thermal infrared radiation of Venus, acquired through earth based and spaceborne (Venera-probe) measurements, are analyzed. The mean value of the spherical albedo of the planet amounts to 0.766 + or - 0.018 (the effective temperature is 228 K). The equatorial and latitudinal distributions of outgoing radiation are examined. It is suggested that the appearance of large scale inhomogeneities in the thermal radiation field associated with a drastic enrichment of the atmosphere by submicron particles can be explained by a burst of the volcanic activity of Venus during 1977-1978. Author

N85-11102# Joint Publications Research Service, Arlington, Va.
H2O PROFILE IN LOWER ATMOSPHERE OF VENUS BASED ON EFFECTIVE RADIATION FLUX MEASUREMENTS Abstract Only c91
M. Ya. Marov, A. P. Galtsev, and V. P. Shari *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 77 Transl. into ENGLISH from Kosm. Issled., v. 22, no. 2, Mar. - Apr. 1984 p 267-272 Original language document announced as A84-34088 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Pioneer-Venus net flux measurements are used to determine vertical distributions of H2O for two sounding regions: the northern probe (59.3 deg: 4.8 deg) and the nighttime probe (28.7 deg: 56.7 deg). It is shown that the H2C vapor content is concentrated in the 20-48 km layer and depends on the time and place of measurement. Author

N85-11103# Joint Publications Research Service, Arlington, Va.
CHANGE IN VENUSIAN ATMOSPHERE ABSORPTION COEFFICIENT WITH ALTITUDE Abstract Only c91
E. G. Yanovitskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 78 refs Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 273-278 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

A method is given of directly determining the distribution of absorption coefficient kappa (h) as a function of height in the Venusian atmosphere by measurement of the amount of light striking a horizontal area both from above and from below over a broad range of wavelengths between 0.5 and 1.2 microns. Such measurements were performed by the Venera-9, Venera-10 and Pioneer-Venus spacecraft. Such measurement is sufficiently reliable, allowing direct determination of the volumetric absorption coefficient kappa (h) and complete restoration of the field of radiation in the deeper layes of the atmosphere, using the equations presented. R.J.F.

N85-11104# Joint Publications Research Service, Arlington, Va.
THEORETICAL STUDY OF ELECTRON CONCENTRATION IN VENUSIAN ATMOSPHERE AS FUNCTION OF ZENITH ANGLE OF SUN AND SOLAR ACTIVITY IN AREAS OF PHOTOCHEMICAL EQUILIBRIUM Abstract Only c91
A. V. Pavlov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 78 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 279-291 Original language document announced as A84-34090 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The area of altitudes from 100 to 200-220 km with sun zenith angles of between 0 and 90 is studied. A model derived in an earlier work is used to study the variation in electron concentration in the area of the major and minor maxima of the Venusian daytime ionosphere as a function of solar zenith angle and solar activity. Further studies of the physical and chemical processes determining the composition of the ionosphere are planned to simplify the method of theoretical modeling of the ionospheric composition. It is shown that at the lower maximum the calculated values of N sub e do not fit linear variation of N sub e as a function of (Ch x)(-1/2) as is suggested in the simple layer theory of Chapman. The areas of the major and upper electron concentration maxima are formed primarily by solar radiation at between 250 and 900 A, at the lower maximum - by solar radiation at 10 to 200 A and photoelectrons. A group of chemically active components is identified whose concentration is determined by photochemical reactions with the participation of only oxygen, carbon, carbon monoxide, carbon dioxide and helium ions, electrons and neutral components. R.J.F.

N85-11105# Joint Publications Research Service, Arlington, Va.
FORBIDDEN LINES OF OXYGEN IN COMET SPECTRA Abstract Only c91
V. A. Krasnopolskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 79 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2 Mar. - Apr. 1984 p 292-296 Original language document announced as A84-34091 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07/MF A01

A comparison of calculations and measurements of the 2972 and 6300/64 A lines is spectra of comet Bradfield shows that the yield of singlet states of atomic oxygen during the dissociation of H2O in the 1216 A line and the neighboring spectral region is about 10 percent. For the dissociation of H2O the velocities of O(1S) and O(1D) are equal to 1.9 and 2.06 km/s; for the dissociation of CO2 they are equal to 4.7 and 2.9 km/s. The superposition of NH2 bands and the irregular character of comet west complicate the evaluation of this comet's gas release on the basis of 6300/64-A luminescence data. Interferometric measurements of comet Kohoutek are in accord with respect to all three parameters (the luminescence intensity of O/1D/6300 A and H-alpha 6563 A, the intensity distribution as a function of distance from the comet nucleus, and the IAA

N85-11106# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SPACE INSTRUMENTATION OF INTERCOSMOS MEMBER COUNTRIES c19
V. Balebaanov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 80-83 Transl. into ENGLISH from Pravda, 22 May 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The international collaboration for the development of space equipment is discussed. The technical basis of many of the experiments involves equipment created especially for this flight by the joint efforts of Soviet and Indian scientists, as well as the ship's and orbital station's regular equipment. This equipment included instruments developed during the preparations for the preceding international expeditions. M.A.C.

N85-11107# Joint Publications Research Service, Arlington, Va.
SPACE RESEARCH BENEFITS NATIONAL ECONOMY c85
I. Yegorova and Yu. Zaytsev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 84-94 Transl. into ENGLISH from Politicheskoye Samobrazovaniye (Moscow), no. 1, Jan. 1984 p 58-66 (For primary document see N85-11060 02-12)

Avail: NTIS HC A07

The role of the space program in the economic development of the Soviet Union is examined. Emphasis is placed on the history and applications of satellite information as well as the continued development of space technology. Objectives of satellite remote sensing include natural resource management, meteorology, geophysics, the improvement of space communications, and increased accuracy of crop inventory and soil moisture detection techniques. M.A.C.

N85-11108# Joint Publications Research Service, Arlington, Va.
ENERGY-ACTIVE ZONES IN NORTH ATLANTIC AS MANIFESTATION OF INTERANNUAL VARIABILITY OF RADIATION BALANCE Abstract Only **c46**
G. I. Marchuk, Ya. Kondratyev, and V. V. Kozoderov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 99 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 3-15 Original language document announced as A84-28683 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

A statistical analysis of the interannual variability of the Earth's radiation budget components and of the ocean surface was performed on the basis of satellite data for June 1974 to February 1978 for the North Atlantic. The existence of characteristic regions of significant variability of the radiation budget associated with energetically active zones of the ocean is disclosed. The characteristic scales of the radiation effect of these zones are determined. IAA

N85-11109# Joint Publications Research Service, Arlington, Va.
SOME STATISTICAL CHARACTERISTICS OF ATMOSPHERIC OPTICAL THICKNESS IN VISIBLE SPECTRAL RANGE Abstract Only **c46**
Sh. A. Akhmedov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 100 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 33-37 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The remote determination of the brightness coefficients for the Earth's surface from artificial earth satellites in the visible spectral region is discussed. The statistical characteristics of total optical thickness on the basis of measurements of atmospheric transparency obtained at siz points in six parts of the spectrum are examined. It is desirable to make such an analysis for different climatic zones and seasons for defining the general patterns and possible differences in the spectral structure of optical thickness. The most important factor determining variations in optical thickness in the interval from 0.34 to 0.63 micrometers, ensuring high corelation matrices determine 98% of the dispersion of optical thickness. M.A.C.

N85-11110# Joint Publications Research Service, Arlington, Va.
SEISMOTECTONIC NATURE OF SOME ANNULAR PHOTOANOMALIES REGISTERED BY REMOTE METHODS Abstract Only **c46**
V. I. Popkov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 101 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 38-40 Original language document announced as A84-28687 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Satellite remote sensing data on ringshaped photoanomalies are examined. It is shown that some of these anomalies are traces of the relaxation of tectonic strains occurring in subsurface levels of the earth. IAA

N85-11111# Joint Publications Research Service, Arlington, Va.
PREDICTING FRACTURING ZONES IN CASPIAN DEPRESSION SUBSALT DEPOSITS ON BASIS OF SPACE INFORMATION AND GEOLOGICAL-GEOPHYSICAL DATA Abstract Only **c46**
I. N. Kapustin and S. Ye. Petrov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 101-102 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 41-50 Original language document announced as A84-28688 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Space photographs of the Astrakhan arch taken at different scales and at different seasons, are compared with data from seismic prospecting, electric prospecting and deep drilling. Several zones of increased fracturing extending in a submeridional direction and oriented almost perpendicular to the strike of the structure are defined. The first experience in using data from remote surveys of the surface in combination with geological/geophysical data for predicting zones of increased fracturing demonstrates that it is quite objective and the method is applicable in other parts of the depression. Photographs with a regional or continental level of generalization are used because these best reveal the peculiarities of structure of the subsalt formations. In the eastern part of the Caspian Depression there are at least five principal systems of lineaments or lineament zones (submeridional, northwesterly, northeasterly, east-southeasterly and sublatitudinal). In calcareous rocks, having a complex structure and marked facies change, it is possible to interpret zones of propagation of high capacity collectors. M.A.C.

N85-11112# Joint Publications Research Service, Arlington, Va.
METHOD FOR INTERPRETING SOIL COVER OF FLOWED FIELDS USING SPECTRAL BRIGHTNESSES MEASURED FROM SPACE PHOTOGRAPHS Abstract Only **c43**
L. N. Vasilyev and A. G. Poluarshinova *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 102-103 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 51-57 Original language document announced as A84-28689 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

A soil-interpretation technique is described which relies on satellite (Meteor-Fragment), aerial, field, and laboratory observations. Cluster analysis of the measured brightness of tilled fields was performed by a specially developed procedure, and the cluster elements were transferred to a landscape map. This approach was used for the soil interpretation of a territory of 20,000 sq km for soils differing in humus content by 2-3.5 percent. (IAA)

N85-11113# Joint Publications Research Service, Arlington, Va.
SPACE OBSERVATION OF LATITUDINAL CHANGES IN VEGETATION COVER Abstract Only **c43**
V. A. Kottsov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 103-104 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 58-61 Original language document announced as A84-28690 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The character of latitudinal variations of spectral contrasts during autumn was studied on the basis of Soyuz-22 multispectral photography. The relationship between these variations and variations of the phenological state of vegetation cover is established. It is concluded that the data make it possible to assess the required accuracy of photometric determinations, as well as the sampling volume and the accuracy of coordinate referencing for the planning of space observations during autumn. (IAA)

N85-11114# Joint Publications Research Service, Arlington, Va.
EVALUATING EFFECTIVENESS OF USING SPACE INFORMATION IN SPECIALIZED HYDROGEOLOGICAL RESEARCH Abstract Only **c43**
I. M. Galperin and Yu. L. Obyedkov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 104 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 68-72 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The expenditures involved in the compilation of hydrogeological maps by satellite imagery and field surveys are compared. The cost of work on medium-scale hydrogeological surveys of open regions in foothill areas, for example, averages 30.8 rubles/sq km. The final production of a hydrogeological map requires 2 or 3 years.

The procedures for the hydrogeological interpretation of space photographs include the following: collection and processing of archival hydrogeological data for the investigated region; preliminary interpretation of photographs; aerovisual observations of investigated region; limited on the ground reconnaissance; office processing of all data. The comparative cost for this type of work is 12.5 rubles per sq. km. The map, by comparison, is produced in 6-8 months. Taking into account that the user of space video information receives this material without cost, the savings in money and work amount to a factor of from 2.5 to 3.5. M.A.C.

N85-11115# Joint Publications Research Service, Arlington, Va.
ECONOMIC EVALUATION OF SPACE SURVEY MATERIALS USE IN LAND IMPROVEMENT ENGINEERING FIELD WORK Abstract Only **c43**
V. I. Corbunov and N. A. Romanova *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Feb. 1984 p 105 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 73-79 Original language document announced as A84-28693 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The effectiveness use of space survey materials in the planning of land improvement systems is evaluated. Virtually the entire territory of the USSR is now covered by space photographs. Maps compiled from space photographs are more informative than those compiled by traditional methods. A method for calculating the hypothetical economic effect from use of space survey data for engineering field work in planning land improvement measures for specific territory is given. The method essentially involves a determination of the comparative economic effectiveness of the traditional method and the method involving use of space photographs. No proper land improvement scheme can be devised by investigation only of the immediate area involved. Such planning requires a sound understanding of a much more extensive area; the use of space photographs makes this effective and economical. In making the favorable evaluations presented in this article no allowance has been made for the costs involved in operation of the space system used for obtaining and processing the images. Author

N85-11116# Joint Publications Research Service, Arlington, Va.
PREDICTING OPTICAL IMAGE DISPLACEMENT VELOCITY IN SURVEY OF EARTH'S SURFACE Abstract Only **c43**
A. B. Batrakov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 106 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 79-85 Original language document announced as A84-28694 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

General analytical relationships are derived for the displacement-velocity components of an image, taking into account the orientation of the photographic camera, its translational displacements and angular velocities, the shape of the Earth's surface, and the mean elevation of the survey area above the reference level. Methodological errors arising due. B.J. (IAA)

N85-11117# Joint Publications Research Service, Arlington, Va.
METHODS FOR DETERMINING ATMOSPHERIC OPTICAL PARAMETERS USING RESULTS OF SPACE SURVEY OF EARTH'S SURFACE Abstract Only **c43**
D. A. Usikov, M. N. Pomenkova, and I. V. Shiyan *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Jan. 1984 p 107 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 86-91 Original language document announced as A84-28695 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Two methods for the synchronous determination of the optical parameters of the atmosphere are described. The first method is based on the fact that one and the same surface region photographed in different spectral bands has different satial contrasts; hence, the variation of these contrasts carries inormation concerning the optical properties of the atmosphere. The second method utilizes multispectral information obtained in absolute brightness values as well as the albedo of certain test areas. The methods were validated in the Bolgaria-1300-II experiment. B.J. (IAA)

N85-11118# Joint Publications Research Service, Arlington, Va.
TECHNOLOGICAL APPROACH TO AUTOMATION OF SPECIALIZED PROCESSING OF SURVEY DATA Abstract Only **c43**
Ye. D. Dogdanskiy, L. A. Kuzenkov, and R. I. Elman *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 108 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 92-100 Original language document announced as A84-28696 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The automation of the thematic processing of remote-sensing images of Earth resources has been carried out with consideration of specific technology requirements. Two structures for a complex of technical facilities are compared and evaluated in terms of productivity and other parameters. As a validation, the proposed approach was applied to the determination of forest valuation indices and forest management mapping. B.J. (IAA)

N85-11119# Joint Publications Research Service, Arlington, Va.
CHOICE OF CARTOGRAPHIC PROJECTION FOR SPACE SYSTEM DATA BANK USED IN STUDYING NATURAL RESOURCES Abstract Only **c43**
V. I. Khizhnichenko *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 109 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 100-109 Original language document announced as A84-28697 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

The interpretation of photographs obtained using space systems for the study of natural resources is accomplished by a comparison of a television panorama obtained from a space vehicle and specialized maps contained in an Earth resources data bank, a data retrieval system which includes a computer and a magnetic memory system. Such maps must be in a cartographic projection which takes into account the particulars of the space survey and which at the same time has the minimum possible level of characteristic distortions. A solution for this problem is proposed. The terrestrial ellipsoid is divided into zones oriented along several spce vehicle tracks on the surface and having such a width that the zone of coverage of any panorama received in a communication contact is situated in only one zone and in the coordinate zone corresponding to it a system of plane coordinates is stipulated which determines some oblique projection. B.G.

N85-11120# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES **c15**
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 131-132 Transl. into ENGLISH from Tass (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

Orbital parameters (apogee, perigee, period, and inclination) along with the date and satellite designation for Soviet space launches are listed. B.G.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-11121# Royal Aircraft Establishment, Farnborough (England).
GEOPOTENTIAL HARMONICS OF ORDER 15 AND 30, FROM ANALYSIS OF THE ORBIT OF SATELLITE 1971-10B
Doreen M. C. Walker Jan. 1984 26 p refs
(RAE-TR-84008; RAE-Space-633; BR92042) Avail: NTIS HC A03/MF A01

The Cosmos satellite 1971-10B passed through exact 15th-order resonance on March 30, 1981, and orbital parameters were determined at 52 epochs from 3500 observations using the orbit refinement program PROP, between 1980 September and 1981 October. The variations in inclination and eccentricity during

this time were analyzed, and 6 lumped 15th-order harmonic coefficients and two 30th-order coefficients were evaluated. The 15th-order coefficients are the best yet obtained for an orbital inclination near 65 deg; previously there were no 30th-order coefficients available at this inclination. The lumped coefficients were used to test the Goddard Earth Model GEM 10B; there is good agreement for 7 of the 8 coefficients. Author (ESA)

N85-11080# Joint Publications Research Service, Arlington, Va.
PERIODIC OSCILLATION OF GYROSTAT-SATELLITE ABOUT ITS CENTER OF MASS IN AN ELLIPTICAL ORBIT Abstract Only
V. V. Sazonov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 60 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 147-158 Original language document was announced as A84-34076 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11082# Joint Publications Research Service, Arlington, Va.
NONLINEAR OSCILLATIONS OF 2 BODY SYSTEM RELATIVE TO CENTER OF MASS IN ELLIPTICAL ORBIT Abstract Only
V. I. Gulyayev, P. P. Lizunov, and N. N. Produenko *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 61 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 165-170 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11096# Joint Publications Research Service, Arlington, Va.
PROBLEM OF DETERMINING HIGHLY ACCURATE COORDINATES OF ARTIFICIAL SATELLITES BY PHOTOGRAPHIC METHODS Abstract Only
D. P. Duman *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 69-70 Transl. into ENGLISH from Astron. Z. (Moscow), v. 61, no. 1, Jan. - Feb. 1984 p 184-189 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-11122*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MAGNETIC SPIN REDUCTION SYSTEM FOR FREE SPINNING OBJECTS Patent Application
Georg F. vonTiesenhausen, inventor (to NASA) Filed 23 Aug. 1984 13 p
(NASA-Case-MFS-25966-1; NAS 1.71:MFS-25966-1; US-Patent-Appl-SN-643522) Avail: NTIS HC A02/MF A01 CSCL 22B

A magnetic system and method is described for reducing the spin rate of a freely rotating or tumbling satellite. Spin reduction is accomplished by the recovery spacecraft having a mast carrying an electrical current carrying coil which encircles the satellite. The magnetic field of the coil is normal to the spin axis of the satellite which causes circular eddy current flow in the housing of the satellite which generates magnetic force opposing the rotation. In another embodiment the magnetic field is generated by the use of an electromagnet on a remote manipulation arm. NASA

N85-11123# Naval Postgraduate School, Monterey, Calif.
APPLICATION OF MODERN GUIDANCE CONTROL THEORY TO A BANK-TO-TURN MISSILE
B. Shin Mar. 1984 171 p
(AD-A145646) Avail: NTIS HC A08/MF A01 CSCL 17/7

Control laws of a bank-to-turn missile using an optimal estimator in terminal guidance were designed and the effect of increasing the number of measurement sensors in the missile to generate more information on the state was investigated. In design of the control law, modern optimal control theory with a quadratic performance index was used. Implementing this control law required use of a Kalman filter as the optimal estimator. The extended Kalman filter algorithm was used since the measurement states were non-linear functions of the state vectors (relative distance, velocity and target acceleration). To test the effects of implementation of the increased measurement sensors, two-, four- and six-measurement sensors were assumed to be implemented in the optimal estimator. The designed guidance laws were evaluated and the effect of the implementation of increased measurement sensors was tested. Simulation results revealed that the designed guidance law was successful within the specified scenarios. The effect of implementation of increased measurement sensors generated more information about the state vectors, but as the Kalman filter algorithm became more complex, the estimator performance was not enhanced to the degree expected. GRA

N85-11034*# Department of Transportation, Washington, D. C. Office of Space Transportation.
COMMENTS ON THE COMMERCIALIZATION OF EXPENDABLE LAUNCH VEHICLES
Donald R. Trilling *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 196-203 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11051*# Morton Thiokol, Brigham City, Utah.
A PROOF-OF-PRINCIPLE GETAWAY SPECIAL FREE-FLYING SATELLITE DEMONSTRATION Abstract Only
R. Gilbert Moore *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 349 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11079# Joint Publications Research Service, Arlington, Va.
THE BELIKT EXPERIMENT
I. A. Strukov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 46-56 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 4, Jul-Aug. 1984 p 5-12 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11120# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 131-132 Transl. into ENGLISH from Tass (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-11124 Rice Univ., Houston, Tex.
MINIMAX OPTIMAL CONTROL IN THE REENTRY OF A SPACE

GLIDER Ph.D. Thesis
Panchapakesan Venkataraman 1984 103 p
Avail: Univ. Microfilms Order No. DA8416550

The numerical solution of minimax problems of optimal control (also called Chebshev problems) arising in the reentry of a space glider are considered. First, a transformation technique is employed in order to convert minimax problems of optimal control into the Mayer-Bolza problem of the calculus of variations. The transformation requires the proper augmentation of the state vector x(t), the control vector u(t), and the parameter vector pi, as well as the proper augmentation of the constraining relations. As a result of the transformation, the unknown minimax value of the performance index becomes a component of the vector parameter being optimized. The transformation technique is then applied to the following Chebshev problems of interest in the reentry of a space glider: (Q1) minimization of the peak dynamic pressure; and (Q2) minimization of the peak heating rate. Dissert. Abstr.

N85-11125# Technische Univ., Munich (West Germany). Luft- und Raumfahrt.
WINGED FIRST STAGES OF SPACE TRANSPORT APPLIANCES [GEFLUEGELTE ERSTSTUFEN VON RAUMTRANSPORTGERAETEN]
Harry O. Ruppe Apr. 1984 70 p Partly in GERMAN and ENGLISH
(TUM-RT-TB-84/3) Avail: NTIS HC A04/MF A01

Winged fully reusable rocket carriers are considered. Flying performances and flight costs were studied for a two stage vehicle with a liftoff mass of 1000 tons. It is found that such vehicles are feasible, but that ballistic first stages are more economical than winged fly back first stages. Winged stages are easier to operate than ballistic ones. Flight costs for reusable carriers are lower with frequent use (100 times or more) and large annual transport volumes (350 ton or more) to low Earth orbits. Author (ESA)

N85-11030*# Teledyne Brown Engineering, Huntsville, Ala.
SMALL PAYLOAD FLIGHT SYSTEMS (SPFS)
Robert A. K. Mitchell *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 120-135 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11032*# European Space Agency, Paris (France). Space Transportation Systems.
EUROPEAN RETRIEVABLE CARRIER (EURECA) AND EVOLUTIONARY SPACE CARRIER FOR MICROGRAVITY, EARTH OBSERVATION AND TECHNOLOGY DEMONSTRATION
R. Mory and Gunther Seibert *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 147-168 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11033*# Space Vector Corp., Northridge, Calif.
CONESTOGA 2: A LOW COST COMMERCIAL SPACE TRANSPORT SYSTEM
Richard O. Rasmussen *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 169-195 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11050*# Martin Marietta Aerospace, New Orleans, La.
EXTERNAL TANK AFT CARGO CARRIER Abstract Only
Thomas B. Mobley *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 348 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-11126 Virginia Polytechnic Inst. and State Univ., Blacksburg.
OPTIMAL NONLINEAR FEEDBACK CONTROL OF SPACECRAFT ATTITUDE MANEUVERS Ph.D. Thesis
Connie Kay Carrington 1983 143 p
Avail: Univ. Microfilms Order No. DA8415938

Polynomial feedback controls are developed for large angle, nonlinear spacecraft attitude maneuvers. Scalar and two state systems are presented as simple examples to demonstrate the method, and several systems of state variables to parameterize spacecraft motion are considered. Both external and internal control torques are treated; in the latter, attention is restricted to momentum transfer maneuvers that permit several order reductions. Several stability theorems with their application to polynomial feedback systems are discussed. Dissert. Abstr.

N85-11127*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE WIND TUNNEL TESTING PROGRAM
A. M. Whitnah and E. R. Hillje Nov. 1984 492 p refs
(NASA-RP-1125; S-535; NAS 1.61:1125) Avail: NTIS HC A21/MF A01 CSCL 22B

A major phase of the Space Shuttle Vehicle (SSV) Development Program was the acquisition of data through the space shuttle wind tunnel testing program. It became obvious that the large number of configuration/environment combinations would necessitate an extremely large wind tunnel testing program. To make the most efficient use of available test facilities and to assist the prime contractor for orbiter design and space shuttle vehicle integration, a unique management plan was devised for the design and development phase. The space shuttle program is reviewed together with the evolutional development of the shuttle configuration. The wind tunnel testing rationale and the associated test program management plan and its overall results is reviewed. Information is given for the various facilities and models used within this program. A unique posttest documentation procedure and a summary of the types of test per disciplines, per facility, and per model are presented with detailed listing of the posttest documentation. E.A.K.

N85-11128*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONCEPTUAL DESIGN AND EVALUATION OF SELECTED SPACE STATION CONCEPTS: EXECUTIVE SUMMARY
Dec. 1983 64 p refs 3 Vol.
(NASA-TM-87382; JSC-19521; NAS 1.15:87382) Avail: NTIS HC A04/MF A01 CSCL 22B

The results of a space station conceptual design and evaluation study are summarized. The study represented a temporary focusing.

Three space station configurations are characterized for user and crew requirements, operation and safety accommodations, engineering considerations including assembly and growth, structural dynamics, communications, thermal control and power systems, as well as system cost. M.A.C.

N85-11129*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONCEPTUAL DESIGN AND EVALUATION OF SELECTED SPACE STATION CONCEPTS, VOLUME 1
Dec. 1983 396 p 3 Vol.
(NASA-TM-87383; JSC-19521; NAS 1.15:87383) Avail: NTIS HC A17/MF A01 CSCL 22B

Space Station configuration concepts are defined to meet the NASA Headquarters Concept Development Group (CDG) requirements. Engineering and programmatic data are produced on these concepts suitable for NASA and industry dissemination. A data base is developed for input to the CDG's evaluation of generic Space Station configurations and for use in the critique of the CDG's generic configuration evaluation process. M.A.C.

N85-11130*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONCEPTUAL DESIGN AND EVALUATION OF SELECTED SPACE STATION CONCEPTS, VOLUME 2
Dec. 1983 188 p refs 3 Vol.
(NASA-TM-87384; JSC-19521; NAS 1.15:87384) Avail: NTIS HC A09/MF A01 CSCL 22B

The partially closed cycle environmental control and Life Support Subsystems is examined. Components of the system include air pressure control, heat control, water management, air and water quality monitors, fire detection and suppression, personnel escape, and EVA support subsystems. M.A.C.

N85-11031*# Boeing Aerospace Co., Seattle, Wash.
MODULAR EXPERIMENTAL PLATFORM FOR SCIENCE AND APPLICATIONS
Allan S. Hill *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 136-148 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11035*# Booz-Allen and Hamilton, Inc., Arlington, Va.
CONCEPT FOR A COMMERCIAL SPACE STATION LABORATORY
Peter W. Wood and Peter M. Stark *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 204-215 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11036*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROLE OF SPACE STATION: THE HOW OF SPACE INDUSTRIALIZATION
William R. Marshall *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 216-241 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22A

N85-11038*# Teledyne Brown Engineering, Huntsville, Ala.
THE EVOLUTION OF SMALL PAYLOAD CARRIER SYSTEMS
C. G. Breaux *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 260-271 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 22B

N85-11061# Joint Publications Research Service, Arlington, Va.
FEATURES AND USES OF PROGRESS CARGO SHIPS Abstract Only
M. Chernyshov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 1 Transl. into ENGLISH from Turkmenskaya Iskra (USSR), 19 Jun. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11063# Joint Publications Research Service, Arlington, Va.
TASS REPORTS LAUNCH OF PROGRESS-22 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 6 Transl. into ENGLISH from Pravda (Moscow), 29 May 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11064# Joint Publications Research Service, Arlington, Va.
PROGRESS-22 DOCKS WITH SALYUT-7 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 7 Transl. into ENGLISH from Sovetskaya Rossiya (Moscow), 31 May 1984 p 2 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11081# Joint Publications Research Service, Arlington, Va.
PLANNING OF NAVIGATION MEASUREMENTS USING TD CRITERION FOR DETERMINATION OF MOVEMENT OF SPACECRAFT BY METHOD OF LEAST SQUARES Abstract Only
M. P. Nevolko, I. S. Drobin, and L. Yu. Belousov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 60-61 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 159-164 Original language doc. was announced as A84-34077 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11083# Joint Publications Research Service, Arlington, Va.
RAPID NONRESONANT ROTATION OF A SPACECRAFT IN NOMINALLY PERIODIC ORBITS IN LIMITED 3 BODY PROBLEM Abstract Only
P. S. Krasilnikov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 62 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 171-180 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11084# Joint Publications Research Service, Arlington, Va.
USE OF GRAVITATIONAL STABILIZATION IN PERFORMANCE OF EXPERIMENTS Abstract Only
M. Yu. Belyayev and T. N. Tyan *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 62 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 181-188 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11085# Joint Publications Research Service, Arlington, Va.
CONTROL OF LATERAL CONJECTORY MOTION OF SPACECRAFT IN ATMOSPHERE Abstract Only
E. N. Dudar and V. A. Yaroshevskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 63 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 189-200 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-11106# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SPACE INSTRUMENTATION OF INTERCOSMOS MEMBER COUNTRIES
V. Balebaanov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 80-83 Transl. into ENGLISH from Pravda, 22 May 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-11131*# Hughes Research Labs., Malibu, Calif.
CHARACTERIZATION OF 8-cm ENGINEERING MODEL THRUSTER Final Report, 12 Apr. 1978 - 12 Sep. 1982
W. S. Williamson Mar. 1984 87 p
(Contracts NAS3-21358; NAS3-21036)
(NASA-CR-174673; NAS 1.26:174673) Avail: NTIS HC A05/MF A01 CSCL 21C

Development of 8 cm ion thruster technology which was conducted in support of the Ion Auxiliary Propulsion System (IAPS) flight contract (Contract NAS3-21055) is discussed. The work included characterization of thruster performance, stability, and control; a study of the effects of cathode aging; environmental qualification testing; and cyclic lifetesting of especially critical thruster components. R.J.F.

N85-11132*# GT-Devices, Alexandria, Va.
INVESTIGATION OF A PULSED ELECTROTHERMAL THRUSTER SYSTEM
R. L. Burton, S. A. Goldstein, B. K. Hilko, D. A. Tidman, and N. K. Winsor 31 Oct. 1984 64 p refs
(Contract NAS3-23866)
(NASA-CR-174768; NAS 1.26:174768; GTD-84-4) Avail: NTIS HC A04/MF A01 CSCL 21C

The performance of an ablative wall Pulsed Electrothermal (PET) thruster is accurately characterized on a calibrated thrust stand, using polyethylene propellant. The thruster is tested for four configurations of capillary length and pulse length. The exhaust velocity is determined with twin time-of-flight photodiode stagnation probes, and the ablated mass is measured from the loss over ten shots. Based on the measured thrust impulse and the ablated mass, the specific impulse varies from 1000 to 1750 seconds. The thrust to power varies from .05 N/kW (quasi-steady mode) to .10 N/kW (unsteady mode). The thruster efficiency varies from .56 at 1000 seconds to .42 at 1750 seconds. A conceptual design is presented for a 40 kW PET propulsion system. The point design system performance is .62 system efficiency at 1000 seconds specific impulse. The system's reliability is enhanced by incorporating 20, 20 kW thruster modules which are fired in pairs. The thruster design is non-ablative, and uses water propellant, from a central storage tank, injected through the cathode. M.A.C.

N85-11133*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF PLASMA ON SOLAR CELL ARRAY ARC CHARACTERISTICS
D. B. Snyder and E. Tyree [1984] 17 p refs Proposed for presentation at the 23rd Aerospace Sci. Meeting, Reno, Nev., 14-17 Jan. 1985; sponsored by the American Inst. of Aeronautics and Astronautics
(NASA-TM-86887; E-2351; NAS 1.15:86887) Avail: NTIS HC A02/MF A01 CSCL 10A

The influence from the ambient plasma on the arc characteristics of a negatively biased solar cell array was investigated. The arc characteristics examined were the peak current during an arc, the decay time as the arc terminates, and the charge lost during the arc. These arc characteristics were examined in a nitrogen plasma with charge densities ranging from 15,000 to 45,000 cu cm. Background gas pressures ranged from 8x1,000,000 to 6x100,000 torr. Over these ranges of parameters no significant effect on the arc characteristics were seen. Arc characteristics were also examined for three gas species: helium, nitrogen and argon. The helium arcs have higher peak currents and shorter decay times than nitrogen and argon arcs. There are slight differences in the arc characteristics between nitrogen and argon. These differences may be caused by the differences in mass of the respective species. Also, evidence is presented for an electron emission mechanism appearing as a precursor to solar array arcs. Occassionally the plasma generator could be turned off, and currents could still be detected in the vacuum system. When these currents are presented, arcs may occur. Author

N85-11134# Naval Weapons Center, China Lake, Calif.
THE EFFECT OF 2 STRENGTH REDUCING TECHNIQUES ON THE ULTIMATE TENSILE STRENGTH OF AISI 4130 STEEL: ROCKET MOTOR CASE VENTING Final Report
M. S. Wright and R. F. Kubin Jun. 1984 17 p
(AD-A145526; NWC-TP-6511) Avail: NTIS HC A02/MF A01 CSCL 21/8

This work is part of a continuing program to find an economical, but safe and reliable, way to vent rocket motors subjected to an external fire. In this study, the effect on the ultimate strength of rocket motor case material of two methods of strength reduction was investigated. The venting of the rocket motor cases makes use of a preferential insulation technique in conjunction with a strength reduction method. One method changes the morphology of the motor case by use of an electron beam weld. Venting using this method is accomplished by preferentially insulating around the weld on the outside of the case but not over the welded area. When subjected to an external fire, large thermal stresses would be induced and would break out the welded area. The second method makes use of a series of patterned microholes drilled into the motor case using a laser beam. Insulation is applied around the outside of the microhole pattern. Again, if subjected to an external fire, large thermal stresses should cause the microhole pattern to crack and break out. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N85-11135*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
DEFORMATION MEASUREMENTS OF COMPOSITE MULTI-SPAN BEAM SHEAR SPECIMENS BY MOIRE INTERFEROMETRY Final Report
Daniel Post, Robert Czarnek, Duksung Joh, and Judy Wood Washington NASA Nov. 1984 100 p refs
(Grant NAG1-359)
(NASA-CR-3844; NAS 1.26:3844) Avail: NTIS HC A05/MF A01 CSCL 11D

Experimental analyses were performed for determination of in plane deformations and shear strains in unidirectional and quasi-isotropic graphite-epoxy beams. Forty-eight ply beams were subjected to 5 point and 3 point flexure. Whole field measurements were recorded at load levels from about 20% to more than 90% of failure loads. Contour maps of U and W displacement fields were obtained by moire interferometry, using reference gratings of 2400 lines/mm. Clearly defined fringes with fringe orders exceeding 1000 were obtained. Whole field contour maps of shear strains were obtained by a method developed for these tests. Various anomalous effects were detected in the displacement fields. Their analysis indicated excess shear strains in resin rich zones in regions of shear tractions; free edge shear strains in quasi-isotropic

specimens in regions of normal stresses; and shear stresses associated with cyclic shear compliances of quasi-isotropic plies in regions of shear tractions. Their contributions could occur independently or in superposition. Qualitative analyses addressed questions of relaxation; influence of contact stress distribution; specimen failure; effect of specimen overhang; nonlinearity; and qualities of 5 and 3 point flexure tests. Author

N85-11136*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FRACTURE TOUGHNESS OF FIBROUS COMPOSITE MATERIALS
C. C. Poe, Jr. Nov. 1984 68 p refs
(NASA-TP-2370; L-15848; NAS 1.60:2370) Avail: NTIS HC A04/MF A01 CSCL 11D

Laminates with various proportions of 0 deg, 45 deg, and 90 deg plies were fabricated from T300/5208 and T300/BP-907 graphite/epoxy prepreg tape material. The fracture toughness of each laminate orientation or lay-up was determined by testing center-cracked specimens, and it was also predicted with the general fracture-toughness parameter. The predictions were good except when crack-tip splitting was large, at which time the toughness and strengths tended to be underpredicted. By using predictions, a parametric study was also made of factors that influence fracture toughness. Fiber and matrix properties as well as lay-up were investigated. Without crack-tip splitting, fracture toughness increases in proportion to fiber strength and fiber volume fraction, increases linearly with E(22)/E(11), is largest when the modulus for non-0 deg fibers is greater than that of 0 deg fibers, and is smallest for [0(m)/90(p)](s) lay-ups. (The E(11) and E(22) are Young's moduli of the lamina parallel to and normal to the direction of the fibers, respectively). For a given proportion of 0 deg plies, the most notch-sensitive lay-ups are [0(m)/90(p)](s) and the least sensitive are [0(m)/45(n)](s) and [alpha](s). Notch sensitivity increases with the proportion of 0 deg plies and decreases with alpha. Strong, tough matrix materials, which inhibit crack-tip splitting, generally lead to minimum fracture toughness. M.G.

N85-11137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INVESTIGATING COMPRESSION FAILURE MECHANISMS IN COMPOSITE LAMINATES WITH A TRANSPARENT FIBERGLASS-EPOXY BIREFRINGENT MATERIALS
Mark J. Shuart and Jerry G. Williams Aug. 1984 9 p refs
(NASA-TM-86306; NAS 1.15:86306) Avail: NTIS HC A02/MF A01 CSCL 11D

The response and failure of a [+ or - 45]s class laminate was studied by transparent fiberglass epoxy composite birefringent material. The birefringency property allows the laminate stress distribution to be observed during the test and also after the test if permanent residual stresses occur. The location of initial laminate failure and of the subsequent failure propagation are observed through its transparency characteristics. Experimental results are presented. E.A.K.

N85-11138*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
DEVELOPMENT OF FAILURE CRITERION FOR KEVLAR-EPOXY FABRIC LAMINATES Interim Report, Aug. 1982 - Aug. 1983
R. C. Tennyson and W. G. Elliott Sep. 1984 69 p refs
(Grant NsG-7409)
(NASA-CR-172465; NAS 1.26:172465) Avail: NTIS HC A04/MF A01 CSCL 11D

The development of the tensor polynomial failure criterion for composite laminate analysis is discussed. In particular, emphasis is given to the fabrication and testing of Kevlar-49 fabric (Style 285)/Narmco 5208 Epoxy. The quadratic-failure criterion with F(12)=0 provides accurate estimates of failure stresses for the Kevlar/Epoxy investigated. The cubic failure criterion was re-cast into an operationally easier form, providing the engineer with design curves that can be applied to laminates fabricated from unidirectional prepregs. In the form presented no interaction strength tests are required, although recourse to the quadratic model and the principal strength parameters is necessary. However, insufficient test data exists at present to generalize this approach for all undirectional prepregs and its use must be restricted to the generic materials investigated to-date. M.G.

N85-11139*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TENSILE STRENGTH OF COMPOSITE SHEETS WITH UNIDIRECTIONAL STRINGERS AND CRACK-LIKE DAMAGE: A BRIEF REPORT
C. C. Poe, Jr. Sep. 1984 27 p refs
(NASA-TM-86310; NAS 1.15:86310) Avail: NTIS HC A03/MF A01 CSCL 11D

The residual strength of composite sheets with bonded composite stringers loaded in tension was determined. The results are summarized. About 50 graphite/epoxy composite panels with crack-like slots were monotonically loaded in tension to failure. Both sheet layup and stringer configuration were varied. The composite panels have considerable damage tolerance. The stringers arrested cracks that ran from the crack-like slots, and the residual strengths were considerably greater than those of unstiffened composite sheets. A stress-intensity factor analysis was developed to predict the failing strains of the stiffened panels. Using the analysis, a single design curve was produced for composite sheets with bonded stringers of any configuration. Author

N85-11140*# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
EFFECT OF STRESS CONCENTRATIONS IN COMPOSITE STRUCTURES Progress Report, 15 Jan. - 15 Jul. 1984
G. D. Babcock and W. G. Knauss [1984] 22 p refs
(Grant NsG-1483)
(NASA-CR-173976; NAS 1.26:173976; SM-8417) Avail: NTIS HC A02/MF A01 CSCL 11D

The goal of achieving a better understanding of the failure of complex composite structure is sought. This type of structure requires a thorough understanding of the behavior under load both on a macro and micro scale if failure mechanisms are to be understood. The two problems being studied are the failure at a panel/stiffener interface and a generic problem of failure at a stress concentration. Author

N85-11141*# Lockheed-California Co., Burbank.
ADVANCED MANUFACTURING DEVELOPMENT OF A COMPOSITE EMPENNAGE COMPONENT FOR L-1011 AIRCRAFT Final Report
T. Alva, J. Henkel, R. Johnson, B. Carll, A. Jackson, B. Mosesian, R. Brozovic, R. OBrien, and R. Eudaily 4 May 1982 86 p
(Contract NAS1-14000)
(NASA-CR-165885; NAS 1.26:165885) Avail: NTIS HC A05/MF A01 CSCL 11D

This is the final report of technical work conducted during the fourth phase of a multiphase program having the objective of the design, development and flight evaluation of an advanced composite empennage component manufactured in a production environment at a cost competitive with those of its metal counterpart, and at a weight savings of at least 20 percent. The empennage component selected for this program is the vertical fin box of the L-1011 aircraft. The box structure extends from the fuselage production joint to the tip rib and includes front and rear spars. During Phase 4 of the program, production quality tooling was designed and manufactured to produce three sets of covers, ribs, spars, miscellaneous parts, and subassemblies to assemble three complete ACVF units. Recurring and nonrecurring cost data were compiled and documented in the updated producibility/design to cost plan. Nondestruct inspections, quality control tests, and quality acceptance tests were performed in accordance with the quality assurance plan and the structural integrity control plan. Records were maintained to provide traceability of material and parts throughout the manufacturing development phase. It was also

determined that additional tooling would not be required to support the current and projected L-1011 production rate. Author

N85-11142# General Dynamics Corp., Fort Worth, Tex.
CUMULATIVE DAMAGE MODEL FOR ADVANCED COMPOSITE MATERIALS Final Technical Report, Jun. 1982 - Oct. 1983
H. R. Miller, K. L. Reifsnider, W. W. Stinchcomb, D. A. Ulman, and R. D. Bruner Wright-Patterson AFB, Ohio AFWAL Mar. 1984 266 p
(Contract F33615-81-C-5049)
(AD-A145441; FZM-7149; AFWAL-TR-84-4007) Avail: NTIS HC A12/MF A01 CSCL 11/4

The overall objective of this program is to develop a cumulative damage model for advanced composite materials. This involves the development of analytical models and experimental procedures for accurately predicting and characterizing the mechanical responses of advanced composites which have been subjected to conditions representative of those seen in service. This report reviews the achievements of the second of the three phases into which this program has been divided. The objective of this second phase was to refine the model developed in the first phase of the program. With the model developed and refined, a third and final phase will be conducted for the purpose of model verification. GRA

N85-11143# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
THE SILANE INTERPHASE OF COMPOSITES: EFFECTS OF PROCESS CONDITIONS ON GAMMA-AMINOPROPYLTRIETHOXYSILANE
S. R. Culler, H. Ishida, and J. L. Koenig 4 Sep. 1984 37 p
(Contract N00014-80-C-0533)
(AD-A145578; CWRU/DMS/TR-16) Avail: NTIS HC A03/MF A01 CSCL 11/4

FT-IR spectroscopy was used to collect spectra of gamma-aminopropyltriethoxy silane (gamma-APS) coupling agent deposited on KBr plates, modelling the silane interphase of composites, to study the effects of heating the gamma-APS film under various environmental conditions. This coupling agent is used in fiber reinforced epoxy composites. An aminebicarbonate salt forms when the sample is dried in a moist carbon dioxide environment giving rise to a series of bands. GRA

N85-11047*# Corning Glass Works, N.Y.
INORGANIC COMPOSITES FOR SPACE APPLICATIONS
J. W. Malmendier *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 321-332 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11D

N85-11733# Joint Publications Research Service, Arlington, Va.
EFFECTIVE MODULI OF ELASTICITY OF UNIDIRECTIONAL FIBROUS COMPOSITE Abstract Only
V. A. Molkov and B. Ye. Pobedrya *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 111 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 3, Mar. 1984 p 586-589 Original language document was announced in IAA as A84-34578 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11194# De Beers Diamond Research Lab., Johannesburg (South Africa).
THE CURRENT STATUS OF DIAMOND AND CUBIC BORON NITRIDE COMPOSITES Abstract Only
P. N. Tomlinson and R. J. Wedlake *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 37 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-11144 State Univ. of New York, Stony Brook.
GRAVITATIONAL EFFECTS ON PREMIXED PARTICLE CLOUD FLAMES Ph.D. Thesis
Narendra Digamber Joshi 1984 182 p
Avail: Univ. Microfilms Order No. DA8416208

Stabilized, premixed, particle cloud flames were studied in upward propagation and downward propagation, at normal gravity conditions. Additionally, the NASA-Lewis Research Center microgravity facilities were employed to study flame propagation under microgravity conditions. Flame temperature profile and heat loss were measured. The heat losses from the flame to the upstream boundary was found to be substantially larger for upward flame propagation compared to downward flame propagation. It is additionally found that radiative transport to the upstream boundary is much larger that conductive transport of heat, but upstream boundary heat losses alone do not account for the compositional existence limits of the flames studied. The integrated heat losses (upstream of the peak flame temperature) are found to be smaller for the upward flame propagation mode than for the downward flame propagation mode. Omni-directional reaction zone heat losses are found to be smaller for microgravity flame conditions than for upward propagating flames. Dissert. Abstr.

N85-11145 British Library Lending Div., Boston Spa (England).
ENERGY-SAVING TECHNOLOGICAL METHODS OF OBTAINING CONTROLLED ATMOSPHERES
B. M. Estrin, A. V. Poshchupkin, V. P. Teplyakov, and A. S. Savelev 18 Jul. 1984 7 p Transl. into ENGLISH from Stal (USSR) p 88-90
(BLL-M-35724-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Recent developments by Tsentroenergochermet (TsEChM) in the area of the preparation and use of controlled atmospheres with special attention to energy saving are described. Included are the DATs-250 ammonia-cracking units, the best of this type in the world, a process for making hydrogen (99.999% pure) from natural gas and ammonia, a method of re-using hydrogen and a new technology for producing exogas from natural gas without the use of monoethanolamine. Author

N85-11146 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF THE GAS-CONTENT OF GAS-LIQUID SYSTEMS
G. T. Almusin, D. A. Egorov, G. S. Sborshchikov, and P. V. Zotov 18 Jul. 1984 6 p refs Transl. into ENGLISH from Izv. (USSR) p 133-135
(BLL-M-35748-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Local values of the true volumetric gas content in gas-liquid systems were determined with the aid of an electric probe that measures the ratio of its retention time in the gas phase to the total measuring time are described. The effectiveness of the system with different types of circuit was compared. The preferred circuit type is specified. Author

N85-11147 British Library Lending Div., Boston Spa (England).
ENGINEERING METHOD OF CALCULATING A TURBULENT DIFFUSION FLAME
V. A. Arutyunov and O. V. Kiselev 18 Jul. 1984 4 p Transl. into ENGLISH from Izv. (USSR) p 169-170
(BLL-M-35761-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The method proposed for calculations on a turbulent diffusion flame was used to develop a model of the flame produced by

industrial twin-channel burners in cylindrical slightly and very confined chambers. Calculated results were checked by experiment. Author

N85-11148*# Colorado State Univ., Fort Collins. Dept. of Physics.
EXPERIMENTS WITH PHASE TRANSITIONS AT VERY HIGH PRESSURE Progress Report, May 1982 - Jun. 1984
Ian L. Spain 1984 35 p refs
(Grant NAG2-157)
(NASA-CR-174029; NAS 1.26:174029) Avail: NTIS HC A03/MF A01 CSCL 07D

A diamond anvil cell is described which was developed for studying hydrogen and other materials to pressure above 100 PGa, including measurements at low temperature. The benefits of X-ray diffraction using synchrotron radiation and using a fixed anode source are examined as well as the optimization of X-ray diffraction at low temperature. A Ge diode detector was incorporated into apparatus for measuring optical absorption, reflectance, and fluorescence in order to enable luminescence studies and Raman spectra were obtained. Results of experiments on Si, Ge, GaP, InAs, hydrogen, benzene, nitrogen, graphite, and the superconductor CeCu2Si2 are given. A.R.H.

N85-11149*# Illinois Univ., Urbana-Champaign. Dept. of Aeronautical and Astronautical Engineering.
THE MECHANISMS OF FLAME HOLDING IN THE WAKE OF A BLUFF BODY Final Report
Roger A. Strehlow and Sarmad Malik 30 Oct. 1984 194 p refs
(Grant NAG3-60)
(NASA-CR-174058; NAS 1.26:174058) Avail: NTIS HC A09/MF A01 CSCL 21B

The flame holding mechanism for lean methane and lean propane air flames is examined under conditions where the recirculation zone is absent. The holding process is studied in detail in an attempt to determine the mechanism of flame holding and also the conditions where this mechanism is viable and when it fails and blow off occurs. Inverted flames held in the wake of a flat strip are studied. The velocity flow field is determined using a Laser Doppler Velocimetry technique. Equation of continuity is used to calculate the flame temperature from the change in area of flow streamlines before and after the flame. For methane air flame the controlling factor for blow off is incomplete reaction due to higher blowing rate leading to reduced residence time in the reaction zone. M.A.C.

N85-11150*# Maryland Univ., College Park. Inst. for Physical Science and Technology.
A HIGH RESOLUTION SPECTROSCOPIC STUDY OF THE OXYGEN MOLECULE Ph.D. Thesis Final Report
Kenneth J. Ritter Nov. 1984 32 p refs
(Grant NAG5-222)
(NASA-CR-174061; NAS 1.26:174061) Avail: NTIS HC A03/MF A01 CSCL 07D

A high resolution spectrometer which incorporates a narrow line width tunable dye laser was used to make absorption profiles of 57 spectral lines in the Oxygen A-Band at pressures up to one atmosphere in pure O2. The observed line profiles are compared to the Voigt, and a collisionally narrowed, profile using a least squares fitting procedure. The collisionally narrowed profile compares more favorable to the observed profiles. Values of the line strengths and self broadening coeffiencients, determined from the least square fitting process, are presented in tabular form. It is found that the experssion by Watson are in closest agreement with the experimentally determined strengths. The self broadening coefficients are compared with the measurements of several other investigators. E.A.K.

N85-11151# Pennsylvania Univ., Philadelphia.
TRIVALENT ION EXCHANGE IN BETA ALUMINA
B. Dunn and G. C. Farrington 6 Jul. 1984 5 p
(Contract N00014-81-K-0526)
(AD-A145373; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

Ion exchange techniques were used to substitute trivalent cations for the sodium ions present in sodium beta alumina single crystals. Complete replacement was achieved using Gd3+, Nd3+, and Eu3+ ions in molten salts. The conductivity of Gd3+ beta alumina was measured and optical properties of Nd3+ exchanged materials were studied. The trivalent beta aluminas appear to be the first solid electrolytes to exhibit rapid trivalent cation motion at moderate temperatures. GRA

N85-11152# State Univ. of New York, Binghamton. Dept. of Chemistry.
VAPORIZATION BEHAVIOR OF CHROMIUM PHOSPHIDES. THE SOLID 2-PHASE REGIONS CrP-Cr12P7, Cr12P7-Cr3P, AND Cr3P-Cr Interim Technical Report, 1 Jul. 1982 - 30 Jun. 1985
C. E. Myers, G. A. Kisacky, and J. K. Klingert 1 Sep. 1984 2019 p
(Contract N00014-82-K-0501)
(AD-A145481; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/2

The vaporization reactions 24/5 CrP(s) = 2/5 Cr12P7(s) + P2(g) (1194-1479K), 2/3 Cr12P7(s) = 8/3 Cr3P(s) + P2(g) (1421-1541K), and 2 Cr3P(s) = 6Cr4(S) + P2(g) (1543-1768K) have been studied by mass-loss effusion in the temperature ranges indicated. The reactions are kinetically inhibited. Enthalpies of formation and atomization respectively were found. Cr P was found to follow the trend in atomization enthalpy to valence state atoms established in the series MnP, FeP, CoP, and NiP. GRA

N85-11153# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
THE DRIVING-FORCE DEPENDENCE OF ELECTROCHEMICAL RATE PARAMETERS: ORIGINS OF ANODIC-CATHODIC ASYMMETRIES FOR METAL AQUO REDOX COUPLES
J. T. Hupp and M. J. Weaver Sep. 1984 37 p
(Contract N00014-79-C-0670)
(AD-A145605; TR-36) Avail: NTIS HC A03/MF A01 CSCL 07/4

The consequences of differences in the intramolecular force constants and the ionic entropies between the oxidized and reduced states of aquo redox couples upon their electrochemical kinetics are examined as a function of the driving force. A generalized harmonic oscillator model is utilized that involves estimating the activation barrier from the individual force constants in the oxidized and reduced states rather than employing average (reduced) values. Noticeable asymmetry in the anodic and cathodic Tafel plots is predicted for redox couples having large (ca. twofold) differences in force constants, the plots being markedly more curved at anodic over-potentials. GRA

N85-11154# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
KINETICS OF SIMPLE INNER- AND OUTER-SPHERE ELECTROCHEMICAL REACTIONS AT ROTATING SILVER ELECTRODES AS EXAMINED USING SURFACE-ENHANCED RAMAN SPECTROSCOPY
S. Farquharson, D. Milner, M. A. Tadayyoni, and M. J. Weaver Sep. 1984 24 p
(Contract N00014-79-C-0670)
(AD-A145606; TR-35) Avail: NTIS HC A02/MF A01 CSCL 07/4

An application of surface-enhanced Raman spectroscopy (SERS) to evaluating the kinetics of electrochemical reactions is outlined. This involves monitoring the potential-dependent SERS intensities of the adsorbed reactant at a rotating disk electrode in a potential region where the kinetics are under mixed mass transfer-heterogeneous electron transfer control. Comparisons are made between the kinetic behavior extracted from the SERS intensity-potential dependence and that obtained from the faradaic current flow. GRA

N85-11155# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
SURFACE ENVIRONMENTAL EFFECTS IN ELECTROCHEMICAL KINETICS: OUTER-SPHERE CHROMIUM (3) REDUCTIONS AT MERCURY, GALLIUM, LEAD, AND THALLIUM SURFACES
H. Y. Liu, J. T. Hupp, and M. J. Weaver Sep. 1984 40 p
(Contract N00014-79-C-0670)

(AD-A145607; TR-34) Avail: NTIS HC A03/MF A01 CSCL 07/4

Electrochemical rate parameters for the outer-sphere reduction of several Cr(3) aquo and ammine complexes and also for vanadium and europium aquo complexes are compared at aqueous-metal interfaces formed with mercury, liquid gallium, lead, and underpotential deposited lead and thallium monolayers on silver. For reactants containing aquo ligands, substantial decreases in the rate constants, both before and after electrostatic double-layer corrections, were observed at a given electrode potential when substituting mercury by the other surfaces, especially lead and gallium. The rate alterations are accompanied by marked decreases in the apparent activation entropies, although offset by corresponding decreases in the measured activation enthalpies. These results are interpreted in terms of the varying influence of these metal surfaces on the interfacial solvent structure. GRA

N85-11156# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
SOLVENT EFFECTS UPON ELECTROCHEMICAL KINETICS: INFLUENCES OF INTERFACIAL SOLVATION AND SOLVENT RELAXATION DYNAMICS
M. J. Weaver Sep. 1984 21 p
(Contract N00014-79-C-0670)
(AD-A145624; TR-38) Avail: NTIS HC A02/MF A01 CSCL 07/4

This paper is intended as a summary of some recent research aimed at gaining a fundamental understanding of solvent effects in electrochemical kinetics. Besides examining the effects of altering the bulk solvent, experiments are also described where the influence of the interfacial solvent structure in aqueous media is probed through variations in the hydrophility of the metal surface. Particularly since some of this recent experimental activity has been associated closely with concurrent theoretical development, it is useful to provide a brief summary of the underlying kinetic formulations. GRA

N85-11157# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE-DIMENSIONAL TWO-PHASE CONSTANT LAG FLOW IN COMBUSTION CHAMBER OF SOLID PROPELLANT ROCKET MOTORS
C. Hsiench'i 15 Aug. 1984 24 p Transl. into ENGLISH from Yuhang Xuebao (China), no. 4, 1983 p 40-52
(AD-A145679; FTD-ID(RS)T-0880-84) Avail: NTIS HC A02/MF A01 CSCL 21/2

A one-dimensional two phase lag flow in a combustion chamber of a solid propellant rocket motor is described. Introducing a specific heat ratio and a gas constant for constant lag flow, fundamental relationships analogous to those of pure gas flow are derived. The effect of particle velocity lags on pressure-time curves and flowfield in the chamber is described. Author

N85-11158# Sandia Labs., Albuquerque, N. Mex.
LASER SPECTROSCOPY AND GAS-PHASE CHEMISTRY IN CVD
P. Ho, M. E. Coltrin, and W. G. Breiland 1984 14 p refs Presented at Intern. Conf. on Laser Processing aand Diagnostics Appl. in Electron. Mater., Linz, Austria, 15 Jul. 1984
(Contract DE-AC04-76DP-000789)
(DE84-014959; SAND-84-0169C; CONF-840761-1) Avail: NTIS HC A02/MF A01

Experimental studies of Chemical Vapor Deposition utilizing laser-diagnostic techniques are closely coordinated with theoretical modelling. Laser-Raman spectroscopy, laser velocimetry and laser-excited fluorescence techniques are used to probe the gas phase. The model carefully treats the coupled fluid dynamics and gas-phase chemistry of silane CVD. Deposition rates predicted by the model agree with data from the literature. The presence of Si2 was predicted by the model and observed with laser-excited fluorescence. The results indicate that gas-phase chemical kinetics and reactive intermediate species are important in silane CVD. DOE

N85-11159# State Univ. of New York, Stony Brook.
TRANSPORT PROPERTIES OF MULTIPHASE SYSTEMS Progress Report, Jul. 1984
G. Stell Jul. 1984 15 p refs
(Contract DE-AC02-79ER-10498)
(DE84-015560; DOE/ER-10498/3) Avail: NTIS HC A02/MF A01

Aims and overall accomplishments are summarized on the following topics: transport in liquids; transport in dilute solutions and suspensions; transport in gases; kinetics of polymer solutions and polymerization; and matrix-function formalism for dispersions, fluids in porous media, and other two-phase systems. DOE

N85-11160# Maryland Univ., College Park. Dept. of Physics and Astronomy.
THE OBSERVATION OF A SINGLE THERMOLUMINESCENCE GLOW PEAK DESCRIBED BY KINETICS MORE GENERAL THAN THE USUAL 1ST AND 2ND ORDER KINETICS
W. F. Hornyak, P. W. Levy (Brookhaven National Lab.), and J. A. Kierstead (Brookhaven National Lab.) 1984 14 p refs Presented at Intern. Archaeometry Symp., Washington, D.C., 1 May 1984
(Contract DE-AC02-76CH-00016)
(DE84-014697; BNL-34965; CONF-8405209-1) Avail: NTIS HC A02/MF A01

At least one thermoluminescence (TL) system CaF2:Mn, exhibits a single glow peak that is not described by the well known 1st or 2nd order TL kinetics. However, the glow peak is described by the more general kinetic expression from which the well-known kinetics are derived. In addition to determining the usual kinetic parameters, E and s, it has been shown that the retrapping to recombination cross section ratio, in the CaF2:Mn TL system, is roughly 10(-5). DOE

N85-11161# Oregon Univ., Eugene. Dept. of Chemistry.
LASER SPECTROSCOPY OF COMBUSTION INTERMEDIATES
P. C. Engelking 1984 5 p refs
(Contract DE-AT06-79ER-10435)
(DE84-016101; DOE/ER-10435/3) Avail: NTIS HC A02/MF A01

The use of laser techniques to probe combustion and which requires knowledge of the spectra of the reacting species, and understanding the reactivity of flame species was examined for radical reaction intermediates. A computer controlled laser induced fluorescence apparatus was used to measure spectra of the a-X transition of CF, the A-X and B-X transitions in several cyano radical cations, the b-X transition in PH, the A-X transition in methylnitrene, and the A-X transition in haloacetylene cations. DOE

N85-11162# Argonne National Lab., Ill.
EFFECTS OF ADDITIVES AND KOH ELECTROLYTE CONCENTRATION ON DISSOLUTION OF IRON ELECTRODES
D. S. Poa, J. F. Miller, and N. P. Yao Jun. 1984 54 p refs
(Contract W-31-109-eng-38)
(DE84-014840; ANL/OEPM-84-1) Avail: NTIS HC A04/MF A01

The effects of additives and KOH concentration on electrochemical dissolution of iron electrodes in KOH electrolytes were investigated by a rotating ring disc electrode. Experimental results were analyzed on the basis of changes of characteristic disc and ring currents and variation of FE(II) species supersaturation at the disc electron surface. When LiOH is added to the electrolyte, the anodic and cathodic dissolution of the iron electrode, forming soluble FE(II) species, and the formation of solid film products at the electrode surface, may be significantly decreased; whereas the reversibility of the iron electrode redox processes may be increased. Saturation of the KOH electrolyte with FeO may cause significant changes in the mechanisms and reaction rates of iron dissolution, because of the competing oxidation reduction of Fe(II) species, which become more available at the electrode surface. The influence of FeO saturation on the dissolution of iron in the form of soluble Fe(II) species, however, is probably not significant. DOE

N85-11163# California Univ., Berkeley. Lawrence Berkeley Lab.
SURFACE CHEMISTRY OF PALLADIUM Ph.D. Thesis

Thomas Matthew Gentle May 1984 415 p refs
(Contract DE-AC03-76SF-00098)
(DE84-014572; LBL-17798) Avail: NTIS HC A18/MF A01

Several classes of catalytically important molecules on Pd single crystals were studied. The influence of surface structure and composition on reactions which involve formation and scission of carbon-carbon and carbon-hydrogen bonds was investigated under uhv conditions on single crystals and higher pressures on polycrystalline films. Reactions of acetylene on Pd(111), Pd(100), and Pd(110) were studied by thermal desorption spectroscopy, chemical displacement reactions, and isotopic labeling techniques. Pd single crystals catalyzes trimerization to benzene, hydrogenation to ethylene, and hydrosilation with trimethylsilane. Several atoms such as Si, P, S, and Cl have a profound influence on the catalysis. Single crystal Pd surfaces catalyzes the dehydrogenation of organosilanes; silacyclohexane chemisorbed on Pd(110) underwent dehydrogenation upon thermal desorption to form silabenzene. Desulfurization products were observed in the thermal desorption spectra chemisorbed thiophene, 3-methylthiophene, and 2,5-dimethylthiophene. Mechanisms of carbon-hydrogen bond scission were investigated for a variety of methyl substituted benzenes, which reveal some degree of regiospecificity in C-H bond scission. Several reactions of unsaturated hydrocarbons are investigated at higher pressures (10(-2) torr) on polycrytalline Pd films. DOE

N85-11164# Physical Sciences, Inc., Andover, Mass.
EXPERIMENTAL AND THEORETICAL STUDY OF CONDENSATION IN MULTICOMPONENT VAPORS Quarterly Report, 15 Feb. - 14 May 1984
G. Wilenski and M. B. Frish Jul. 1984 17 p refs
(Contract DE-AC02-84ER-13154)
(DE84-015610; PSI-TR-441; QR-1) Avail: NTIS HC A02/MF A01

Work performed during the first quarter of a multi-year program to study condensation in multi-component vapors is described. Design of the supersonic flow/laser light scattering experiment is discussed. Calculations of nucleation onset conditions were performed for the water-methanol and water-ethanol systems using a revised classical theory of binary nucleation. The calculations agree well with experimental diffusion cloud chamber results and differ significantly from standard classical theory results at high water concentrations. DOE

N85-11054*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADVANCES IN ELECTROPHORETIC SEPARATIONS Abstract Only
R. S. Snyder and P. H. Rhodes *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 368 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 07D

N85-11072# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON SALYUT-7 ELECTROPHORESIS, PLUGGING MORTAR EXPERIMENTS Abstract Only
V. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 25 Transl. into ENGLISH from Pravda (Moscow), 21 Jul. 1984 p 6 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11752# Joint Publications Research Service, Arlington, Va.
LINEAR LONG-WAVE STABILITY OF CYLINDRICAL STEADY LAMINAR FLAME IN ROTATING MEDIUM Abstract Only
P. P. Lazarev and A. S. Pleshanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 31-32 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 6, Nov. - Dec. 1983 p 36-41 Original language document was announced as A84-19769 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11783# Joint Publications Research Service, Arlington, Va.
COMBUSTION AND DETONATION OF HYDROGEN-AIR MIXTURE IN FREE SPACES Abstract Only
V. I. Makeyev, Yu. A. Gostintsev, V. V. Strogonov, Yu. A. Bokhon, Yu. N. Chernushkin, and V. N. Kulikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 100-101 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 16-18 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11784# Joint Publications Research Service, Arlington, Va.
LIMITING EFFECTS DURING TURBULENT COMBUSTION Abstract Only
A. M. Klimov and V. N. Iebedev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 101-102 Transl. into ENGLISH from Fiz. Goreniya i Vzrvya (Novosibirsk), v. 19, no. 5, Sep. - oct. 1984 p 7-9 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11785# Joint Publications Research Service, Arlington, Va.
DIFFUSIVE COMBUSTION OF FLUIDS WITH FREE SURFACE Abstract Only
S. N. Milkov, G. S. Sukhov, and L. P. Yarin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 102 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 3-6 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-11165 Michigan State Univ., East Lansing.
THE EFFECT OF OVERLOAD ON THREE DIFFERENT KINDS OF STEEL Ph.D. Thesis
Mohammad Ghobadi 1984 173 p
Avail: Univ. Microfilms Order No. DA8415218

Axial strain controlled tests are performed on plan carbon steels of three different geometriesin order to determine the effect of initial and periodic overloading on fatigue properties and microstructures. The overload is applied in the range expected to have a significant effect. To study the effect of cycling on the microstructure, some of the specimens are polished and etched, and plastic replicas are taken at regular intervals during the fatigue test. Initial overstrain results in a decrease of the fatigue life of all specimens. Dissert. Abstr.

N85-11166 Carnegie-Mellon Univ., Pittsburgh, Pa.
EFFECT OF MICROSTRUCTURE AND TRAPPING ON THE HYDROGEN EMBRITTLEMENT SUSCEPTIBILITY OF A TITANIUM BEARING HSLA STEEL Ph.D. Thesis
Michael Francis Stevens 1984 198 p
Avail: Univ. Microfilms Order No. DA8414754

The general hydrogen embrittlement susceptibility of a Ti-bearing High Strength Light Alloy HSLA steel is characterized and correlated with detailed microstructural studies, hydrogen permeability and trapping analyses. The hydrogen permeability studies show that austenitized and quenches microstructures composed of essentially low interaction energy reversible trap site for hydrogen including but not restricted to grain boundaries, solute elements and dislocations. Precharged uniaxial tensile testing establishes that the formation of even 10-15 A diameter clusters of TiC could bring about a 50% improvement in ductility compared to microstructures lacking this phase. Both bulk hydrogen diffusivity and diffusable hydrogen content are important. Dissert. Abstr.

N85-11167 British Library Lending Div., Boston Spa (England).
DETERMINING THE OPTIMUM HEATING PARAMETERS FOR

PRECISION ALLOYS
E. L. Gyulikhandanov, N. A. Zaripova, A. S. Kalugin, V. V. Kislenkov, O. A. Osolodkhin, and Yu. I. Onuchin 18 Jul. 1984 6 p refs Transl. into ENGLISH from Stal (USSR) p 59-60
(BLL-M-35718-(5824.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Types 29NK and 47 ND iron mickel alloys are heated in furnaces fired with natural gas with an air consumption coefficient of alpha = 1.0 to 1.1. To work out a technology for nonoxidizing heating of billets of these alloys, the effects of the composition of gases in the furnace on the growth kinetics of the surface oxide layers (scale) and of the internal oxidation layer were studied. Time, temperature, and gas parameters for nonoxidizing heating of these precision alloys were determined. It is shown that the optimum value of alpha = 0.6 to provide nonoxidizing heating can be achieved if the furnaces are reconstructed. A.R.H.

N85-11168 British Library Lending Div., Boston Spa (England).
THERMODYNAMICS OF REACTIONS OF DEOXIDATION OF NICKEL MELTS
B. D. Nikolaev, V. P. Chebunin, M. P. Naumenko, and A. L. Sobolevskii 18 Jul. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh Chern. Met. (USSR), no. 11, 1983 p 4-7
(BLL-M-35729-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The thermodynamic parameters of reactions of deoxidation of nickel by lanthanum, yttrium, boron, cerium, and beryllium were determined. The magnitude of the thermal effects on solution of the examined solvent elements in liquid metal was assessed. A procedure was developed for calculating the equilibrium concentrations of oxygen in multi-component nickel melts. Author

N85-11169 British Library Lending Div., Boston Spa (England).
THERMODYNAMICS OF DECARBURIZATION OF NIOBIUM-BEARING HIGH-ALLOY MELTS
E. K. Kim, V. I. Grigoryan, V. I. Miroshnichenko, and D. T. Kabaev 18 Jul. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), no. 11, 1983 p 1-4
(BLL-M-35728-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The equilibrium ratios of carbon with chromium were examined with account taken of the additional influence of niobium on the thermodynamic activity of carbon, chromium, and oxygen. The effect of converting the decarburization process to vacuum is assessed. Results of experiments conducted in laboratory conditions confirm the accuracy of calculated results. The results obtained make it possible to forecast the behavior of carbon, chromium, and niobium during oxidizing treatment of niobium-bearing high-chromium melts. Author

N85-11170 British Library Lending Div., Boston Spa (England).
ALLOYING SPECIALLY LOW CARBON SILICON-BEARING STEEL WITH NITROGEN
D. Ya. Povolotskii, O. K. Tokovoi, V. G. Pegov, V. A. Sinelnikov, and M. V. Abezgauz 18 Jul. 1984 5 p refs Transl. into ENGLISH from Stal (USSR), no. 11, 1983 p 19-21
(BLL-M-35707-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The possibility of nitrogenizing low carbon silicon steel with the injection of nitrogen through a magnesite lance installed in the ladle bottom is investigated. Aluminum was supplied at the rate of 290-640 g/t directly to the zone in which the bubbles float out. This introduces 0.001 to 0.002% nitrogen to the steel. The final nitrogen content may well increase to 0.008 to 0.010%. Author

N85-11171 British Library Lending Div., Boston Spa (England).
A METHOD FOR EVALUATING THE CONTAMINATION OF STEEL IN RELATION TO THE SOLIDIFICATION CURVE
P. T. Shevchuk, B. A. Greshishchev, and S. A. Kozlov 18 Jul. 1984 5 p refs Transl. into ENGLISH from Izv. (USSR), no. 11, 1983 p 41-42
(BLL-M-35735-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The primary solidification curve is used to determine steel quality. The use of nondimensional time, defined as the extent to which solidification is completed, when interpreting the primary solidification curve, presents considerable possibilites of comparing steel quality for different temperatures. The relationships established between characteristics and parameters of the solidification curve and the total amount of non-metallic inclusions in the steel makes it possible to forecast the extent of contamination by the method of thermal analysis. M.A.C.

N85-11172 British Library Lending Div., Boston Spa (England).
THE OXIDATION OF TRANSITION-METAL IONS BY MOLECULAR OXYGEN
Myung-ja Kim 18 Jul. 1984 11 p refs Transl. into ENGLISH from Progr. in Chem. and Ind., v. 14, no. 6, 1974 Presented at 34th Ann. Meeting of Korean Chem. Soc., 25 Oct. 1974
(BLL-M-29593-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The kinetics and the mechanisms of oxidation reduction reactions occurring by electron transfer in metal ion or molecular oxidizing or reducing agents are examined. The experimental reaction rate equation indicates that autoxidations using transition metal ions include a one rate determining step of simple reaction order for transition metal ions and oxygen molecules. Transition metals are diverse in their chemical reactions and their ions also display novel autoxidation reactions. M.A.C.

N85-11173 British Library Lending Div., Boston Spa (England).
METHOD FOR CALCULATING LINEAR SHRINKAGE AND EXPANSION OF METALS AND ALLOYS
V. Ya. Shevchenko, V. N. Moskovchenko, V. G. Glushchenko, and V. T. Yakovlev 18 Jul. 1984 8 p refs Transl. into ENGLISH from Izv. Vyshh. Ucheb. Zaved. Chernaya Met. (USSR), no. 11, 1983 p 125-129
(BLL-M-35747-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The coefficients of thermal expansion and shrinkage of metals and alloys were investigated at temperatures ranging from their melting point T sub m to room temperature. A study was made of the correlation of the thermodynamic potential of metals and alloys with the coefficient of thermal expansion at temperatures of (0.1-0.9)T sub m. Correlation equations for the given parameters are presented. An equation is derived for calculating the temperature of the start of linear shrinkage for any alloy. Author

N85-11174 British Library Lending Div., Boston Spa (England).
DIRECTIONAL NATURE OF STRENGTHENING DURING THERMOMECHANICAL TREATMENT
O. I. Shavrin, L. L. Lukin, L. T. Kreknin, A. S. Efimov, and V. B. Dementev 18 Jul. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR) p 116-119
(BLL-M-35746-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

A procedure is advanced for selecting the method of deformation for thermomechanical treatment which takes into account the load application pattern and stressed state when products are in use. The results of applying loads in different manners and the resulting strained states are described. Author

N85-11175 British Library Lending Div., Boston Spa (England).
CALCULATIONS OF OPTICAL PROPERTIES OF TRANSITION METALS
N. I. Kulikov, O. T. Malyuchkov, and S. I. Yakhimovich 18 Jul. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), no. 11, 1983 p 88-91
(BLL-M-35744-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Using the method of tetrahedra, an expression is obtained for numerical calculations of matrix elements of optical transitions in transition metals. The results of using the proposed method for calculating the imaginary part of relative permittivity in the case of chromium are discussed. Curves of interzonal absorption in a

paramagnetic and an antiferromagnetic phase of chromium under pressure and under normal conditions are calculated. Results of calculation are in good agreement with experimental data. M.A.C.

N85-11176 British Library Lending Div., Boston Spa (England).
LATTICE DILATION IN METAL-HYDROGEN SYSTEMS
V. V. Meshcheryakov 18 Jul. 1984 5 p refs Transl. into ENGLISH from Izv. (USSR) p 167-168
(BLL-M-35758-(5825.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A brief account is given of a theoretical approach to the solution of the problem of how the partial volume of hydrogen depends on the volume of the atoms of the metal in which it is dissolved.
Author

N85-11177# Council for Scientific and Industrial Research, Pretoria (South Africa).
INTERNATIONAL CONFERENCE ON RECENT DEVELOPMENTS IN SPECIALTY STEELS AND HARD MATERIALS. CONFERENCE ABSTRACTS Abstracts Only
1982 106 p Conf. held in Pretoria, 8-12 Nov. 1982; sponsored by the International Union of Pure and Applied Physics
(CSIR-S-256) Avail: NTIS HC A06/MF A01

The mechanical and microstructural properties of specialty steels and hard materials are discussed. Emphasis is placed on forming techniques, corrosion resistance, and crystal growth. The effects of alloying materials on a variety of steels are also examined. For individual titles, see N85-11178 through N85-11216.

N85-11178# Massachusetts Inst. of Tech., Cambridge.
RAPID SOLIDIFICATION PROCESSING AND THE CONTROL OF STRUCTURE/PROPERTY RELATIONSHIPS Abstract Only
In CSIR Inter. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 1 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The underlying fundamentals of nucleation and growth during rapid solidification are discussed in terms of supercooling, interfacial phenomena, and massive (segregationless) solidification. An important consequence of Rapid Solidification Process (RSP) is that the alloy chemistry can be designed so that the second phase precipitates are particularly stable and resist coalescence at high temperatures. As a result, such particles remain effective in pinning grain boundaries and, in turn, inhibit grain growth during thermomechanical processing or heat treatment after the rapid solidification. M.A.C.

N85-11179*# Cambridge Univ. (England). Dept. of Metallurgy and Materials Science.
MICROSTRUCTURAL DESIGN IN LOW ALLOY STEELS Abstract Only
R. W. K. Honeycombe *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 3 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The evolution of microalloyed steels from plain carbon steels is examined with emphasis on grain size control by use of Nb, Ti and V additions and by the application of controlled rolling. The structural changes during controlled rolling are described as well as the influence of alloying elements on these changes, and on the final microstructure. The achievement of high strength and toughness is discussed including the role of inclusions. Author

N85-11180# Max-Planck-Inst. fuer Metallforschung, Stuttgart (West Germany). Inst. fuer Werkstoffwissenschaften.
MICROSTRUCTURAL DESIGN AND CONTROL OF SINTERED HARD MATERIALS Abstract Only
H. E. Exner *In* CSIR Intern. conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 5 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The importance of microstructure in the four technologically important groups of hard materials, namely tool steels, cemented carbides, ceramics and superhard materials is discussed. Powder technology allows tailoring of the microstructure of such materials to specific application conditions. Some basic principles for controlling the size of the individual crystals and the phase distribution in such materials are outlined. M.A.C.

N85-11181# Max-Planck-Inst. fuer Metallforschung, Stuttgart (West Germany).
TOUGHNESS IN HIGH SPEED STEELS AND HARD METALS Abstract Only
H. Fishcmeister *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 7 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

A fracture mechanical discussion is given of flaw induced, rupture in semibrittle materials. Fracture toughness data for high speed steels and hard metals are reviewed. Typical flaws acting as fracture sources in hard metals are pores, inclusions and eta phase regions. In high speed steels, critical flaws form by subcritical growth of cracks in the stringers. This explains the strong directionality of rupture strength, its dependence on hot reduction, and its absence in powder metallurgy materials. Its most important aspect is the nature of the nucleation sites for fracture in extremely small stressed volumes. Rupture experiments indicate that microfracture may be caused by debonding at carbide/carbide or carbide/matrix interfaces. M.A.C.

N85-11182# Birmingham Univ. (England). Dept. of Metallurgy and Materials.
MICROSTRUCTURE AND DEFORMATION ASPECTS OF SOME SPECIALTY STEELS AND HARD METALS Abstract Only
R. E. Smallman *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 9 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Some aspects of the basic microstructure and deformation mechanisms of metals are considered in relation to specialty steels and hard metals. The strength/ductility properties of dual phase steels, the work hardening behavior of austenitic stainless steels and the influence of the martensite transformation, and the grain size control and plasticity of tungsten carbide are discussed.
M.A.C.

N85-11183# Laval Univ. (Quebec).
COPPER-BORON LOW ALLOY HIGH STRENGTH STEELS Abstract Only
M. R. Krishnadev, G. J. Sojka (Saskatchewan Univ.), I. LeMay (Saskatchewan Univ.), and L. McD. Schetky (International Copper Research Association, Inc.) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 11 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

A new class of low alloy high strength steels suitable for the construction of welded structures requiring low transition temperatures, such as arctic applications, has been developed. It is based on a low carbon Cu-B composition. The strengthening mechanism is based on a recently discovered synergistic effect of Cu-B which provides higher strengthening than can be achieved in the well known Mo-B bainitic steels. Due to the high solid solubility of copper, greater strengthening can be achieved through normalizing or a quench and age treatment than can be achieved with Nb V or Ti. Strength levels in excess of 600 MPa with transition temperatures below -80 C have been demonstrated with a copper level of 1.8% and 9 ppm of boron. Author

N85-11184# Open Univ., Milton (England). Dept. of Materials Science.
RAPID SOLIDIFICATION OF STEELS: MODEL AND COMMERCIAL ALLOYS Abstract Only
J. V. Wood and J. V. Bee (Witwatersrand Univ.) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 17 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Rapid Solidification Processing is already being applied commercially to the production of high alloy steels and superalloys. The purpose of this paper is to present the results of a detailed study of commercial toll steels and model Fe-Ni and Fe-Mn based alloys produced by melt spinning and pendant drop melt extraction are presented. The as quenched microstructures are described for the industrial alloys. In the model steels, the effects of vanadium and carbon additions to the base compositions are considered in terms of both the as quenched structures and their response to simple heat treatments. B.W.

N85-11185# National Physical Lab., Teddington (England).
MICROSTRUCTURAL BASIS OF STRENGTH AND TOUGHNESS IN HARDMETALS Abstract Only
E. A. Almond *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 19 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

By considering results of recovery experiments and observations of deformed structures and fractures, it is shown that various microstructural requirements for obtaining strength and toughness in WC-Co hardmetals can be deduced from simple analogue models based on fiber composites and statistical theory. Carbide contiguity, binder phase spacing, the propensity for microcracking, and the work hardening capacity of the binder phase are important parameters in determining the resistance to overload fracture, thermal shock, fatigue and stress corrosion. Author

N85-11186# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Physics.
MAGNETIC PROPERTIES OF THE COBALT MATRIX IN WC-Co COMPACTS Abstract Only
Haydee leRoux and D. S. McLachlan *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 21 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

A series of sintered WC-Co hardmetals containing 3 to 25 wt% Co and a presintered (i.e., compressed but unsintered) hardmetal containing 8 wt% Co were studied by measuring their magnetic properties in a Foner magnetometer. Internal demagnetizing factors (N sub if) of the hardmetals were obtained from inverse slopes of anhysteretic magnetisation curves after correcting for external demagnetizing factors. The very small magnitudes of N sub if of sintered materials confirm that Co is not present as discrete particles but as a continuous interlinked network of ferromagnetic thin films resembling a ferromagnetic sponge. The decrease in coercivity (h sub C) occurring on densification is ascribed to magnetostatic interactions between newly bonded Co films. Whereas the H sub C of the continuous matrix depends on the mean Co layer thickness the remanence ratios (j), after correction for an external demagnetizing factor, depend on the thickness of the thickest Co films present. Relationships between Co content and/or WC grain size and some magnetic properties (N sub if, H sub c, and j sub r) are established. Some mechanical properties are considered. Author

N85-11187# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Physics.
THE PALMQVIST TEST AND ITS APPLICATIONS IN WC-Co ALLOYS Abstract Only
Silvana Bartolucci Luyckx *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 23 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The Palmquist test is a controversial test, which, despite some objections, is gaining acceptance by the hardmetal community. The development of the test into its present form is reviewed. Attempts are made to relate the test results to toughness and suggested applications of the test to both research and production are presented. B.W.

N85-11188# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Metallurgy.
THE INTER-RELATION OF MICROSTRUCTURE, TOUGHNESS AND FATIGUE CRACK GROWTH BEHAVIOUR IN WC-Co HARDMETALS Abstract Only
P. R. Fry and G. G. Garrett *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 25 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Utilizing the double torsion test specimen geometry, the toughness and fatigue crack propagation behavior of WC-Co hardmentals have been studied as a function of Co-content and grain size and have been shown to respond identically to microstructural manipulation. Fractographically, the two crack processes are indistinguishable and mechanistically static fracture can be shown to control cyclic crack growth. A procedure is indicated whereby fatigue crack propagation rate can be estimated through a knowledge of the more readily measurable fracture toughness. Author

N85-11189# California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.
DESIGN OF STRONG, DUCTILE, DUPLEX LOW ALLOY STEELS Abstract Only
Gareth Thomas *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 27-28 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Current alloy design programs at Berkeley which are summarized which utilize the concept of two-phase steels as a means of optimising the mutually exclusive properties. The underlying principle here is to utilize composites whereby the advantages of the second phase are optimised while the less desirable features of this phase are simultaneously mitigated by the presence of the other constituent phase. The size, distribution, shape and volume fraction of the second phase critically control the mechanical behavior of the dual phase systems. As a consequence, these structures offer a degree of metallurgical flexibility that is absent in single phase structures or in many precipitation strengthened systems, for attaining optimum sets of mechanical properties. Examples are presented here of matensite/austenite (approx. 2-5%) mixtures designed for optimum combinations of high strength, toughness and wear properties in medium carbon steels, e.g., for mining and agricultural applications, and martensite/ferrite (approx. 80%) structure for high strength good formability and improved low temperature ductility in low carbon steels. B.W.

N85-11190# Climax Molybdenum Co., New York.
A REVIEW OF WORLD WIDE DEVELOPMENT IN STAINLESS STEELS Abstract Only
R. M. Davison, T. R. Laurin, J. D. Redmond, H. Watanabe, and M. Semchyshen *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 29-30 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

A review is given of developments in the production of stainless steels. The improved pitting and corrosion resistance of higher alloyed austenitic stainless steels and the improvement of touchness and weldability in ferritic stainless steels are among the topics discussed. R.J.F.

N85-11191# Technion - Israel Inst. of Engineering, Haifa. Dept. of Materials Engineering.
MARAGING STEELS: STRUCTURE, PROPERTIES AND APPLICATIONS Abstract Only
B.-Z. Weiss *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 31-32 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The structure, properties, and applications of maraging steels and martensitic stainless steels are discussed. Toughness, precipitation processes, and hardening are among the topics discussed. R.J.F.

N85-11192# Sandvikens Jernwerks, A. B. (Sweden). Dept. of Hard Materials Research.
SOME REFLECTIONS ON THE COMPETITION AMONG DIFFERENT HARD MATERIALS IN INDUSTRIAL APPLICATIONS Abstract Only
Bertil Aronsson *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 33 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The competition that improved grades of cemented carbide will meet partly from harder materials such as new ceramics, especially nitride-base ceramics, and partly from tougher materials such as coated high-speed steels is discussed. The emphasis is on application areas where a transition to new hard materials seems economically advantageous. Examples are given of the influence of raw materials and process parameters on the microstructure and properties of the competing materials and various ways for reducing the production costs to ensure a stable quality level will be discussed. R.J.F.

N85-11193# Sintex-Pacific Hard Metals Corp., Beaverton, Oreg.
DEVELOPMENT AND PERFORMANCE OF CVD-COATINGS ON CUTTING TOOLS Abstract Only
E. Rudy, B. F. Kieffer (Teledyne Refractory Metals Group), and T. Penrice (Teledyne Refractory Metals Group) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 35-36 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The thermodynamic fundamentals of the chemical vapor deposition of TiN, TiC, HfN, Al2O3 and of combinations of carbides, nitrides and carbonitrides on cemented carbide substrates are discussed along with the practical implementation in large scale industrial coating facilities. The improved performance of coated, in comparison with uncoated tools, is primarily due to the increased cratering resistance provided by coatings. The relative merits of different coating systems are strongly dependent on work material properties and chosen cutting parameters: coatings of Al2O3 have excellent performance at higher cutting speeds and harder steels, but are generally inferior to nitride - and carbide-based (TiN, TiC, HfN) coatings when cutting softer steels at intermediate and low cutting speeds. The combined effect of work material properties and cutting parameters (principally feed and speed), and tool geometry on cutting performance can be characterized through a single quantity, the cutting shear angle. R.J.F.

N85-11194# De Beers Diamond Research Lab., Johannesburg (South Africa).
THE CURRENT STATUS OF DIAMOND AND CUBIC BORON NITRIDE COMPOSITES Abstract Only **c24**
P. N. Tomlinson and R. J. Wedlake *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 37 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The development of high pressure technology which allowed the synthesis of diamond and cubic boron nitride also resulted in the production of a number of ultra-hard ceramic-type materials. These materials, polycrystalline diamond and cubic boron nitride composites, offer distinct advantages over their single crystal counterparts and hold the promise of a fascinating future in all areas connected with material removal and other specialist usages. R.J.F.

N85-11195# Middelburg Steel and Alloys (Proprietary) Ltd. (South Africa).
METALURGY OF A 12 PERCENT CHROMIUM STAINLESS STEEL Abstract Only
C. R. Thomas and J. P. Hoffman *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 39 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The structure and properties of 3CR12, a titanium stabilised 12% chromium steel, are affected by chemical composition and heat treatment. These steels were optimized to produce a corrosion resisting steel with useful mechanical properties in thicknesses between 3 and 30mm. Metallurgical changes brought about by the welding operation involve the formation of a duplex ferritic/martensitic heat affected zone (HAZ), with an accompanying increase in hardness and a loss in ductility. Effects on the mechanical properties of chemical modifications and thermo-mechanical treatment are examined, and properties and applications of the alloy are reviewed. E.A.K.

N85-11196# Allegheny Ludlum Steel Corp., Brackenridge, Pa. Research Center.
ALLOYING EFFECTS OF REACTIVE ELEMENTS IN FERRITIC STAINLESS STEELS Abstract Only
P. R. Borneman *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 41-42 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The use of elements which are strongly attracted to carbon, nitrogen and oxygen for deoxidation during melting and for carbide stabilization in stainless steels is outlined. Most such reactive metal elements are strong ferrite formers and their use as alloying elements in austenitic stainless teels is limited. The development of melting practices which allow the production of ferritic stainless steels with low interstitial content and presents an opportunity for application of the reactive elements as alloy additions in their own right. Niobium and tantalum additions through precipitation hardening by an intermetallic Laves phase improves creep life. The stabilization, can be totally or partially accomplished with a more reactive element such as titanium, leaving the entire niobium or tantalum content available for precipitation hardening. Higher than normal annealing temperatures are required to dissolve the Laves phase so to produce precipitation hardening. None of the other reactive elements produce a strong precipitation hardening effect. Aluminum additions have little effect upon the precipitation hardening obtained with niobium and tantalum. E.A.K.

N85-11197# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Metallurgy.
THE EFFECT OF REPLACING MOLYBDENUM WITH VANADIUM ON THE CORROSION RESISTANT PROPERTIES OF STAINLESS STEELS Abstract Only
R. D. Davies, C. J. Gross, P. vanBiljon, and F. P. A. Robinson *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 43 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The effect of replacing molybdenum with vanadium both fully and partially, on the corrosion resistant properties of wrought ferritic, and wrought and cast austenitic stainless steels is examined. Corrosion testing involved anodic polariztion in H2SO4 and determination of the pitting potential in 0.1N NaCl. It was found that vanadium improves the pitting resistance of all alloys in NaCl, and had a beneficial effect on the passivation characteristics of the ferritic and wrought austenitic alloys in H2SO4. The element had a detrimental effect on passivity in the cast austenitic alloys, which is related to a varying ferrite/austenite ratio, segregation of alloying elements to the ferrite phase, and preferential attack of the austenite phase. It is found that molydenum is more effective than vanadium on a weight for weight basis in conferring corrosion resistance. E.A.K.

N85-11198# National Tsing Hua Univ., Hsinchu (Taiwan). Dept. of Materials Science and Engineering.
STRAIN HARDENING AND STRAIN AGING IN Fe-Al-Mn ALLOYS Abstract Only
C. M. Wan, H. J. Lai, M. T. Jahn, and J. Heh (Chung Cheng Inst. of Technology) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 45 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Four Fe-Al-Mn alloys were studied for strain aging and post quench aging. Various temperatures and aging times were used. Specimens were subjected to different prestrain cold working

treatments during the strain aging process. Microstructural examinations were concentrated by optical means and results were related to the mechanical properties of the materials which had been subjected to different treatments. It is suggested that the appearance of a beta-Mn phase is the main reason for the hardening phenomenon. E.A.K.

N85-11199# Annawerk Keramische Betriebe G.m.b.H., Roedental (West Germany). Ceranox Div.

NON-OXIDE CERAMICS: A NEW CLASS OF ENGINEERING MATERIALS Abstract Only c27

E. Gugel *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 47 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The nonoxide ceramic materials are the latest developments in materials technology and increasingly used to solve materials problems which is due to their most interesting profile of mechanical thermal and chemical properties. The nonoxide ceramic materials are considered as established new group of materials, which can be used for energy production and energy conversion, especially in high temperature engines. They have taken an important place in abrasion and chemical corrosion resistance. The basic chemistry and microstructure of the two most interesting, silicon nitride and silicon carbide based materials were investigated. The technological aspects were investigated and it is now possible to produce even complicated shapes of satisfactory homogeneity with a high degree of performance ability. E.A.K.

N85-11200# National Physical Research Lab., Pretoria (South Africa).

THERMODYNAMIC CALCULATIONS AND THE CHEMICAL VAPOUR DEPOSITION OF HARD MATERIALS Abstract Only c77

Angus I. Kingon and Robert F. Davis (North Carolina State Univ.) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 49-50 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The value of a thermodynamic analysis of the chemical vapor deposition (CVD) system is discussed. In setting up a process for the CVD of a particular material, the processor has the choice of a number of gaseous precursors, and a larger number of thermodynamic parameters such as pressure, temperature and concentrations of the gaseous precursor and carrier gases. A thermodynamic description of the system is valuable in providing an understanding of the process, and in predicting the phases which will be deposited or codesposited under various conditions, along with the yields of these phases. The CVD phase diagrams provide a method for presenting these data. This allows an efficient approach to setting up and optimizing the CVD process. Methods to obtain the thermodynamic description are discussed. Deviations from the calculated results under thermodynamic equilibrium conditions are outlined. E.A.K.

N85-11201# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.

EROSION OF SINTERED WC-Co ALLOYS Abstract Only

H. Conrad, Y. Shin, and G. A. Sargent (Notre Dame Univ.) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 53 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The effects of WC grain size in the range of 0.9 to 0.3 microns and Co contents of 4.5 to 11.3 wt.% on the erosion of sintered WC-Co alloys was investiaged using a sandblaster-type erosion tester employing 240 grit Al2O3 particles carried in an air stream at velocities of 30 to 100 m/sec and impact angles of 20 to 90 deg. Limited SEM studies were made of the surface damage produced by the erosion. No clear effect of WC grain size on the erosion rate (E sub R) superscript WC-Co (grams material removed per gram of particles) was established. The effects of volume fraction Co(f sub Co), particle velocity (v), and angle of impact (alpha) on (E sub R) superscript WC-Co was given by: (E sub R) superscript = a + (F sub Co) = a (B sub 90) (F sub Co) + (B-B sub 90) (F sub Co) where a = A(v sin alpha)(2), B sub 90 = B(v sin alpha(3.2) and (b-b B sub 90) = C(v cos alpha)(2). A, B, and C are constants. The results are discussed in terms of existing theories of the erosion of ductile and brittle materials. R.S.F.

N85-11202# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Laboratorium.

THE INFLUENCE OF METALLURGICAL ASPECTS ON THE PITTING CORROSION BEHAVIOUR OF HIGH ALLOY STAINLESS STEELS Abstract Only

M. B. Rockel, E. Wallis, and P. Wincierz *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 55 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The resistance of high alloyed stainless steels to pitting corrosion was determined by the electrochemical test method. The pitting corrosion resistance decreases with increasing temperature, however differently, for the various steel types. The linear correlation between the Cr and Mo content and the pitting potential according to the so called pitting index factor % Cr + 3.3 x % Mo describes the results in the range of lower pitting index values as expected. At higher values and higher electrolyte temperatures deviations occur, but the increase of the pitting potential is still monotonic. Additionally, the effect of heat treatment and welding on the pitting resistance is determined. With increasing heterogeneity the pitting potential is shifted to less noble potentials. Thus, the weld seam is preferentially attacked because of its solidification structure. Author

N85-11203# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).

THE ADHESION OF HARD AND WEAR RESISTANT COATINGS Abstract Only

H. E. Hintermann and P. Laeng *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 57-58 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

No valuable means was available to characterize the mechanical properties of the substrate/coating interface, in particular the adhesion strength, and to correlate it to an industrially interesting property such as flaking, spalling, or chipping - neither on a laboratory scale nor - even less so - for quality control in production. For this reason the scratch test was developed. The scratch test is used to determine the adhesive or cohesive strength of hard coatings deposited on steel and cemented carbide. A diamond cone is used to scratch the surface of the coated specimen at a constant speed and under a stepwise or continuously increasing load. The critical load, at which the coating flakes off or chips off, is determined by optical or electron microcopy and/or by acoustic emission detection. R.S.F.

N85-11204# Connecticut Univ., Storrs.

WEAR PROPERTIES OF RAPIDLY SOLIDIFIED SURFACES OF A PSEUDO-BINARY Fe-TiC ALLOY Abstract Only

P. R. Strutt, B. G. Lewis, and B. H. Kear (Exxon Research and Enginering Co., Linden, N.J.) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 59 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The wear behavior of the steel-base cemented carbide material Ferro-TiC (SK) was studied following electron beam glazing and tempering treatments. A distinction is made between wear of SK against a moderately hard martensitic stainless steel (17-4PH), and a hard molybdenum-base high speed steel (M42). Glazing is found to produce a three-fold increase in the wear life in tests performed using a fully hardened M42 high speed steel counterface material. Author

N85-11205# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.

THE CONSTITUTION AS THE BASIS FOR RECENT AND

FUTURE DEVELOPMENTS OF WEAR RESISTANT MATERIALS Abstract Only

H. Holleck *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 61 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The composition and properties of super hard materials, hard compounds, ceramics, hard metals, and high speed steels were investigated. Recent and future developments are outlined. Problems with raw materials supply, materials loss by wear, energy consumption, and the development of new technologies directly affect these developments. Factors which are favorable for the controlled development of wear resistant materials by applying special phase equilibria are: (1) metal-rich hard metals, hardened in Fe- or Ni-basis binder phase; (2) carbide-rich hard metals, hardened in the carbide or binder phase by transformations; (3) multicomponent ceramic systems with optimized microstructure; (4) polyphase materials on the basis of hard substances such as B4C, SiC, AlN, and Si3N4; and (5) further development of superhard materials. R.S.F.

N85-11206# Climax Molybdenum Co. of Michigan, Ann Arbor.

RECENT DEVELOPMENTS ON THE ROLE OF MOLYBDENUM IN IRONS AND STEELS Abstract Only

M. Semchyshen *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 63 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The iron and steel industry represents about 85% of the annual demand for molybdenum. In recent years both producers and consumers of irons and steel have carried out aggressive research and development programs leading to materials of improved strength, toughness and corrosion resistance. These developed products are able to cope with a greatly extended range of temperatures and corrosive environments, and are produced more economically with greater commercial performance reliability. The incentives for these developments are new technical challenges, the increased cost of energy and inflationary cost pressures. Facilitating the development of new steels was a better understanding of the physical metallurgy of steels and alloys and the concomitant introduction of new steelmaking and processing technology. The latest trends for molybdenum-containing carburizing steels, evaluated temperature steels, oil industry products, gas transmission line pipe and rail steels are summarized. Significant advances in the use of molybdenum in cast irons will also be discussed. (Numerous references were provided or pursuit of details of the new developments). Author

N85-11207# Highveld Steel and Vanadium Corp. Ltd., London (England).

THE USE OF VANADIUM IN LOW ALLOY STRUCTURAL STEELS Abstract Only

Arthur M. Sage *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 65 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The various mechanisms by which vanadium and other microalloying elements affect the microstructure and hence strength, toughness and weld properties of HSLA steels are reviewed. The use of vanadium in steels currently produced is summarized and an indication is given of how vanadium could be used in HSLA steels if other microalloying elements were in short supply. Author

N85-11208# Technion - Israel Inst. of Tech., Haifa. Dept. of Materials Engineering.

SWAGED Mo-5 PERCENT W ALLOY AND RECRYSTALLIZED COMMERCIALLY PURE MOLYBDENUM Abstract Only

A. Rosen *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 67-68 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

Subgrain formation occurs in refractory metals when subjected to creep deformation at elevated temperatures. A swaged Mo-5%W alloy and recrystallized commercially pure molybdenum were investigated. The substructure varied according to the degree of swaging deformation or during creep. The substructure was investigated by transmission electron microscopy. Two substructural parameters were measured: (1) the average subgrain size and (2) the distribution of the misorientation angles between the subgrains. The misorientation angles were measured by the shift of Kikuchi lines in the selected area diffraction patterns of neighboring subgrains. Both parameters affect the creep rate in the temperature range 11000 to 1400 C and the stress range 30 to 1000 MPa. In order to describe the effect, a model was proposed, which is based on the mechanism of plastic deformation during creep under conditions of well-developed substructure. The essence of the model is thermo-activated slip of dislocations from one subgrain boundary to another. Author

N85-11209# Pretoria Univ. (South Africa). Dept. of Metallurgical Enginering.

AN INVESTIGATION INTO THE SUPERHARDENING EFFECT IN MOLYBDENUM-FREE STEEL WITH SPECIFIC REFERENCE TO ALLOY SUBSTITUTION Abstract Only

R. J. Mostert (Iscor Research Dept.) and G. T. vanRooyen *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 69 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

The influence which the superheating of a steel melt has on its hardenability was determined using a combination of three hardenability tests. The hardenability of some alloy steels are drastically increased if the melt is superheated to a minimum of 1650 C combined with a high deoxidant level (Al is > or equal to 0.05%). It is proposed that the ideal critical diameter of steel treated by this superhardening treatment may be calculated by the equation D (sub I) superhardening = (D (sub I) base) squared/55 mm, for D (sub I) base is > or equal to 55 mm. Isothermal transformation diagrams indicate that the superhardening treatment causes the pearlite and bainite noses to be strongly displaced to longer times. The possibility of using the superhardening effect to extend the properties of conventional low-alloy steel qualities into markets traditionally served by higher alloyed steels is reviewed, and it is concluded that serious attention should be given to alloying element conservation by means of this treatment. Author

N85-11210# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Metallurgy.

THE INFLUENCE OF RARE EARTH ELEMENTS ON THE TEMPER EMBRITTLEMENT BEHAVIOUR AND MECHANICAL PROPERTIES OF A LOW ALLOY STEEL Abstract Only

W. Barrett, J. V. Bee, and G. G. Garrett *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 71 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

As a potential replacement for molybdenum, the influence of rare earth metal (REM) additions on the temper embrittlement characteristics of a low alloy steel was determined. REM's were found to effectively inhibit this phenomenon, mainly through chemical fixation of residual impurities by compound formation. Detailed analysis of inclusion size and volume fraction revealed that these parameters also have a major effect on the Charpy impact test upper shelf energy. Author

N85-11211# National Physical Research Lab., Pretoria (South Africa).

THE DETERMINATION OF SOLUBLE AND INSOLUBLE BORON IN STEEL BY EMISSION SPECTROMETRY USING AN INDUCTIVELY COUPLED PLASMA AND A SCANNING MONOCHROMATOR Abstract Only

P. M. Mathews, Y. Milo, and H. G. C. Human *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 73 (For primary document see N85-11177 02-26)

Avail: NTIS HC A06/MF A01

Small amounts of boron improve the hardenability of low

carbon, low alloy steels and evidence is mounting that only the boron in solid austenitic solution is responsible for this effect. Analytical methods were therefore investigated to determine soluble and insoluble boron in steel. Author

N85-11212# Exxon Research and Engineering Co., Florham Park, N.J.
THE ROLE OF MOLYBDENUM AS AN ALLOY ELEMENT IN ADHESIVE WEAR RESISTANCE Abstract Only
Z. A. Foroulis *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 75 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The beneficial effect of molybdenum as an alloying element on corrosion resistance of nickel-base alloys is well known and understood. Less well known and not well understood is the role of molybdenum as an alloying element on sliding wear resistance. The influence of molybdenum on sliding wear of nickel-base and cobalt-base alloys is examined. The wear behavior was investigated using a combination of a rotating ring and a flat stationary block. Scanning electron microscopy (SEM) and electron microprobe examination were also used as an aid in understanding the wear mechanism. Cobalt-molybdenum based alloys have superior wear resistance compared to that of the nickel-molybdenum alloys. The superior wear resistance of the cobalt-molybdenum alloys is attributed to hard second-phase precipitates (Laves of Co3Mo2Si to Co5Mo2Si composition) and to the close-packed hexagonal (CPH) structure of both matrix and precipitate which limits deformation under the influence of loading. The mechanism of wear of these alloys is consistent with Archard's adhesion theory. Author

N85-11213# De Beers Diamond Research Lab., Johannesburg (South Africa).
THE GROWTH OF TWINS AND TWIN LAMELLAE IN SYNTHETIC DIAMOND CRYSTALS Abstract Only **c76**
N. J. Pipkin *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 77 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The growth histories of a number of synthetic diamond crystals have been studied by cathodoluminescence imaging of crystal sections. It is found that twins and twin lamellae, when formed, nucleate during the early stages of the growth process and the development of the [100] and [111] growth sectors on either side of such boundaries proceeds independently. These effects can have a marked influence on the final morphology of the diamond crystals. Author

N85-11214# ISCAR Ltd., Nahariya (Israel).
NEW TITANIUM CARBIDE GRADE FOR METAL CUTTING Abstract Only
R. Sivan, R. Porat, and Y. Landau *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 83 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Hardmetals based on titanium carbide are shown to be considerably more economical then conventional tungsten based materials. Their major restrictions to market penetration is poor performance as a result of relatively low edge strengths and occasional failure by plastic deformation. A new group of TiC hardmetal with important additions of vanadium carbide and titanium nitride show consistently high strengths and improved resistance to plastic deformation. The development of such grades is discussed and their performance illustrated with examples from applications in major industrial concerns. Author

N85-11215# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Metallurgy.
THE STRUCTURE OF RAPIDLY SOLIDIFIED NICKEL-BASE ALLOYS Abstract Only
J. V. Bee and J. V. Wood *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 95 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

The rapid solidification of nickel base superalloys is currently being extensively studied in the search for superior gas turbine materials. Initial results suggest that marked improvements in formability and mechanical properties is achieved, compared with conventional material. The development of the observed solidification structures in some rapidly solidified commercial superalloys (In 100, In 792, Nimonic 80A, APK1) produced by the melt spinning and pendant drop melt extraction methods is described and the subsequent development of fine gamma prime precipitates during heat treatment is explained. Preliminary data from an investigation of some simple model binary and ternary nickel alloys is presented. Author

N85-11216# Technion - Israel Inst. of Tech., Haifa. Dept. of Materials Engineering.
MICROSTRUCTURE AND CREEP BEHAVIOUR AT ELEVATED TEMPERATURE OF UNIDIRECTIONALLY SOLIDIFIED EUTECTIC NICKEL BASE SUPERALLOYS Abstract Only
S. F. Dirnfeld, Y. Zuta, and D. Schwam *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 97 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

Ni-W, Ni-W-Al, Ni-Mo and Ni-Mo-Al eutectic alloys are subjected to a process of unidirectional solidification (UDS) with a view to a composite of ductile matrix containing fibres or lamellae of comparatively high strength. The post-UDS structure of the Ni-W eutectic consist of a Ni(W) solid solution gamma-matrix, reinforced with W-(alpha) fibers (or lamellae at high solidification rates), in addition to which it contains semicoherent Ni4W-(beta) precipitates in the matrix. The transition from a fibrous to a lamellar morphology is discussed. The orientation relationships between the phases in each case were determined by electron diffraction or X-rays (laue back reflection technique). The creep behavior of the binary specimens is examined under constant and increasing load at 930-1000 C. Observations of the fracture surface and microstructural changes during the creep process is examined by SEM and TEM. Author

N85-11217*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE REACTIONS OF COBALT, IRON AND NICKEL IN SO-2 ATMOSPHERES: SIMILARITIES AND DIFFERENCES
Nathan S. Jacobson and Wayne L. Worrell (Pennsylvania Univ., Philadelphia) Jun. 1984 13 p refs Presented at the 3rd Intern. Conf. on Transport in Non-Stoichiometric Compounds, University Park, Pa., 11-15 Jun. 1984
(Contract NSF DMR-79-23647)
(NASA-TM-86868; E-2331; NAS 1.15:86868) Avail: NTIS HC A02/MF A01 CSCL 11F

The reactions of cobalt, iron and nickel in SO2 atmospheres are reviewed and compared. A mixed oxide-sulfide product layer is observed in all cases. Cobalt and nickel exhibits similar behavior. The observed rates are near the sulfidation rates, and the reaction rate is strongly influenced by the outward diffusion of metal through an interconnected sulfide network. A continuous interconnected sulfide is not observed in the oxide-sulfide scales formed on iron, and the reaction rates are more difficult to summarize. The differences and similarities among the three metals are explained in terms of the absence of scale-gas equilibrium and the ratio of the metal diffusivity in the corresponding oxide and sulfide. Author

N85-11218*# Aluminum Co. of America, Alcoa Center, Pa.
A STUDY OF ENVIRONMENTAL CHARACTERIZATION OF CONVENTIONAL AND ADVANCED ALUMINUM ALLOYS FOR SELECTION AND DESIGN. PHASE 1: LITERATURE REVIEW Report, 17 Mar. 1981 - 30 Apr. 1980
D. O. Sprowls Hampton, Va. NASA. Langley Research Center 31 Aug. 1984 110 p refs
(Contract NAS1-16424)
(NASA-CR-172387-Phase-1; NAS 1.26:172387-Phase-1) Avail:

NTIS HC A06/MF A01 CSCL 11F

A review of the literature is presented with the objectives of identifying relationships between various accelerated stress corrosion testing techniques, and for determining the combination of test methods best suited to selection and design of high strength aluminum alloys. The following areas are reviewed: status of stress-corrosion test standards, the influence of mechanical and environmental factors on stress corrosion testing, correlation of accelerated test data with in-service experience, and procedures used to avoid stress corrosion problems in service. Promising areas for further work are identified. Author

N85-11219*# Aluminum Co. of America, Alcoa Center, Pa.
A STUDY OF ENVIRONMENTAL CHARACTERIZATION OF CONVENTIONAL AND ADVANCED ALUMINUM ALLOYS FOR SELECTION AND DESIGN. PHASE 2: THE BREAKING LOAD TEST METHOD Final Report, 1 May 1982 - 31 Aug. 1984
D. O. Sprowls, R. J. Bucci, B. M. Ponchel, R. L. Brazill, and P. E. Bretz Hampton, Va. NASA. Langley Research Center 31 Aug. 1984 311 p refs
(Contract NAS1-16424)
(NASA-CR-172387-Phase-2; NAS 1.26:172387-Phase-2) Avail: NTIS HC A14/MF A01 CSCL 11F

A technique is demonstrated for accelerated stress corrosion testing of high strength aluminum alloys. The method offers better precision and shorter exposure times than traditional pass fail procedures. The approach uses data from tension tests performed on replicate groups of smooth specimens after various lengths of exposure to static stress. The breaking strength measures degradation in the test specimen load carrying ability due to the environmental attack. Analysis of breaking load data by extreme value statistics enables the calculation of survival probabilities and a statistically defined threshold stress applicable to the specific test conditions. A fracture mechanics model is given which quantifies depth of attack in the stress corroded specimen by an effective flaw size calculated from the breaking stress and the material strength and fracture toughness properties. Comparisons are made with experimental results from three tempers of 7075 alloy plate tested by the breaking load method and by traditional tests of statistically loaded smooth tension bars and conventional precracked specimens. M.A.C.

N85-11220*# Lockheed-California Co., Burbank.
DEVELOPMENT OF POWDER METALLURGY 2XXX SERIES Al ALLOYS FOR HIGH TEMPERATURE AIRCRAFT STRUCTURAL APPLICATIONS Final Technical Report, 15 Aug. 1981 - 30 Sep. 1982
D. J. Chellman Nov. 1984 58 p refs
(NASA-CR-172408; NAS 1.26:172408; LR-30322) Avail: NTIS HC A04/MF A01 CSCL 11F

The objective of the present investigation was to improve the strength and fracture toughness combination of P/M 2124 Al alloys in accordance with NASA program goals for damage tolerance and fatigue resistance. Two (2) P/M compositions based on Al-3.70 Cu-1.85 Mg-0.20 Mn with 0.12 and 0.60 wt. pct. Zr were selected for investigation. The rapid solidification rates produced by atomization were observed to prohibit the precipitation of coarse, primary Al3Zr in both alloys. A major portion of the Zr precipitated as finely distributed, coherent Al3Zr phases during vacuum preheating and solution heat treatment. The proper balance between Cu and Mg contents eliminated undissolved, soluble constituents such as Al2CuMg and Al2Cu during atomization. The resultant extruded microstructures produced a unique combination of strength and fracture toughness. An increase in the volume fraction of coherent Al3Zr, unlike incoherent Al20Cu2Mn3 dispersoids, strengthened the P/M Al base alloy either directly by dislocation-precipitate interactions, indirectly by a retardation of recrystallization, or a combination of both mechanisms. Furthermore, coherent Al3Zr does not appear to degrade toughness to the extent that incoherent Al20Cu2Mn3 does. Consequently, the addition of 0.60 wt. pct. Zr to the base alloy, incorporated with a 774K (935 F) solution heat treatment temperature, produces an alloy which exceeds all tensile property and fracture toughness goals for damage tolerant and fatigue resistant applications in the naturally aged condition. Author

N85-11221*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
THE TRANSIENT OXIDATION OF SINGLE CRYSTAL NiAl+Zr M.S. Thesis. Final Report
Joseph K. Doychak Sep. 1983 243 p refs
(Grant NAG3-58)
(NASA-CR-174756; NAS 1.26:174756) Avail: NTIS HC A11/MF A01 CSCL 11F

The 800 C oxidation of oriented single crystals of Zr doped beta-NiAl was studied using transmission electron microscopy. The oxide phases and metal-oxide orientation relationships were determined to characterize the transient stages of oxidation prior to the transformation to or formation of alpha-Al2O3. On (001) and (012) metal orientations, NiAl2O4 was the first oxide to form followed by delta-Al2O3 which becomes the predominant oxide phase. All oxides were highly epitaxially related to the metal; the orientation relationships being function of parallel cation close-packed directions in the meta and oxide. On (011) and (111) metal orientations, gamma-Al2O3 became the predominant oxide phase rather than delta-Al2O3, indicating a structural stability from the highly epitaxial oxides. The relative concentration of aluminum in the oxide scales increased with time indicating preferential gamma-or delta-Al2O3 growth. The striking feature common to the orientation relationships is the alignment of [100] m and [110] ox directions, believed to result from the minimal 3 percent mismatch between the corresponding (100)m and (110)ox planes. M.G.

N85-11222*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN ELECTROCHEMICAL STUDY OF HYDROGEN UPTAKE AND ELIMINATION BY BARE AND GOLD-PLATED WASPALOY
Merlin D. Danford, Gordon E. DeRamus, Jr., and James R. Lowery Oct. 1984 28 p refs
(NASA-TM-86479; NAS 1.15:86479) Avail: NTIS HC A03/MF A01 CSCL 11F

Two electrochemical methods for the determination of hydrogen concentrations in metals are discussed and evaluated. The take-up of hydrogen at a pressure of 5000 psi by Waspaloy metal was determined experimentally at 24 C. It was found that the metal becomes saturated with hydrogen after an exposure time of about 1 hr. For samples charged with hydrogen at high pressure, most of the hydrogen is contained in the interstitial solid solution of the metal. For electrolytically charged samples, most of the hydrogen is contained as surface and subsurface hydrides. Hydrogen elimination rates were determined for these two cases, with the rate for electrolytically charged samples being greater by over a factor of two. Theoretical effects of high temperature and pressure on hydrogen take-up and elimination by bare and gold plated Waspaloy metal was considered. The breakthrough point for hydrogen at 5000 psi, determined experimentally, lies between a gold thickness of 0.0127 mm (0.0005 in.) and 0.0254 mm (0.001 in.) at 24 C. Electropolishing was found to greatly reduce the uptake of hydrogen at high pressure by Waspaloy metal at 24 C. Possible implications of the results obtained, as they apply to the turbine disk of the space shuttle main engine, are discussed. Author

N85-11223*# Michigan Technological Univ., Houghton.
THE EFFECT OF TANTALUM AND CARBON ON THE STRUCTURE/PROPERTIES OF A SINGLE CRYSTAL NICKEL-BASE SUPERALLOY M.S. Thesis. Final Report
Hung C. Nguyen Oct. 1984 100 p refs
(Grant NAG3-216)
(NASA-CR-174779; NAS 1.26:174779) Avail: NTIS HC A05/MF A01 CSCL 11F

The microstructure, phase chemistry, and creep and hot tensile properties were studied as a function of tantalum and carbon levels in Mar-M247 type single crystal alloys. Microstructural studies showed that several types of carbides (MC, M23C6 and M5C) are

present in the normal carbon (0.10 wt % C) alloys after heat treatment. In general, the composition of the MC carbides changes from titanium rich to tantalum rich as the tantalum level in the alloy increases. Small M23C6 carbides are present in all alloys. Tungsten rich M6C carbides are also observed in the alloy containing no tantalum. No carbides are present in the low carbon (0.01 wt % C) alloy series. The morphology of gamma prime is observed to be sensitive to heat treatment and tantalum level in the alloy. Cuboidal gamma prime is present in all the as cast structures. After heat treatment, the gamma prime precipitates tend to have a more spheroidal like morphology, and this tendency increases as the tantalum level decreases. On prolonged aging, the gamma prime reverts back to a cuboidal morphology or under stress at high temperatures, forms a rafted structure. The weight fraction and lattice parameter of the spheroidal gamma prime increases with increasing tantalum content. Changes in the phase chemistry of the gamma prime matrix and gamma prime have also been analyzed using phase extraction techniques. The partitioning ratio decreases for tungsten and aluminum and increases for tantalum as the tantalum content increases for both alloy series; no significant changes occur in the partitioning ratios of the other alloying elements. A reduction in secondary creep rate and an increase in rupture time result from increasing the tantalum content and decreasing the carbon level. R.J.F.

N85-11224*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STUDIES ON THE HOT CORROSION OF A NICKEL-BASE SUPERALLOY, UDIMET 700
Ajay K. Misra Nov. 1984 47 p refs
(Grant NCC3-43)
(NASA-TM-86882; E-2314; NAS 1.15:86882) Avail: NTIS HC A03/MF A01 CSCL 11F

The hot corrosion of a nickel-base superalloy, Udimet 700, was studied in the temperature range of 884 to 965 C and with different amounts of Na2SO4. Two different modes of degradation were identified: (1) formation of Na2MoO4 - MoO3 melt and fluxing by this melt, and (2) formation of large interconnected sulfides. The dissolution of Cr2O3, TiO2 in the Na2SO4 melt does not play a significant role in the overall corrosion process. The conditions for the formation of massive interconnected sulfides were identified and a mechanism of degradation due to sulfide formation is described. The formation of Ns2MoO4 - MoO3 melt requires an induction period and various physiochemical processes during the induction period were identified. The factors affecting the length of the induction period were also examined. The melt penetration through the oxide appears to be the prime mode of degradation whether the degradation is due to the formation of sulfides or the formation of the Na2MoO4 - MoO3 melt. Author

N85-11225*# Pratt and Whitney Aircraft, East Hartford, Conn.
HOT ISOSTATICALLY PRESSED MANUFACTURE OF HIGH STRENGTH MERL 76 DISK AND SEAL SHAPES Final Report
D. J. Evans Jul. 1982 12 p 2 Vol.
(Contract NAS3-20072)
(NASA-CR-165550; NAS 1.26:165550; PWA-5574-149) Avail: NTIS HC A02/MF A01 CSCL 11F

The performance of a HIP MERL 76 disk installed in an experimental engine and exposed to realistic operating conditions in a 150 hour, 1500 cycle endurance test is examined. Post test analysis, based on visual, fluorescence penetrant and dimensional inspection, indicates that the disk performs satisfactorily. M.A.C.

N85-11226# Oak Ridge National Lab., Tenn.
EDS ROUND-ROBIN EVALUATION OF TYPE 308 AUSTENITIC STAINLESS STEEL
J. M. Vitek 1984 7 p refs Presented at Microbeam Analysis Soc. Analytical Electron Microscop. Meeting, Bethlehem,. Pa., 19 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014574; CONF-840767-3) Avail: NTIS HC A02/MF A01

Compositional analysis using transmission electron microscopy and EDS detectors has made significant advances in the last decade, with regard to both equipment available and data analysis procedures. Concentrations determined using this technique are commonly quoted in the literature. However, a large variety of hardware and software is presently available and standard procedures for specimen preparation, data acquisition, and data reduction have not been established. Therefore, detailed comparisons of results from different sources may not be very accurate. Variations that may exist in compositional evaluations when performed by different investigators using different equipment are studied. A round-robin analysis of identical specimens was initiated and the results are reported. DOE

N85-11227# California Univ., Livermore. Lawrence Livermore Lab.
ELECTROLYTIC LAPPING TECHNIQUE FOR VANADIUM
P. K. Ambalal and C. W. Price 1984 19 p refs Presented at 17 Ann. Convention of the Intern. Metallographic Soc., Philadelphia, 15 Jul. 1984
(Contract W-7405-eng-48)
(DE84-014710; UCRL-90378; CONF-840766-1) Avail: NTIS HC A02/MF A01

An electrolytic lapping technique was developed for vanadium to take advantage of the many benefits this technique already offers with other metals. Vanadium is particularly susceptible to surface smearing and embedment of particulate material during mechanical grinding and polishing; both of these problems are eliminated by electrolytic lappin. In addition, the technique is sufficiently reproducible to greatly facilitate preparation of large quantities of spcimens. The use of electrolytic lapping also was a critical factor in the development of an etching technique which clearly delineates a wide range of deformation structures in vanadium. Exampls of the application of this technique are presented from a study of the recrystallization of vanadium. Another equally important application of electrolytic lapping is the preparation of specimens for surface analytical techniques. DOE

N85-11228# Denver Univ., Colo. Dept. of Physics.
DETECTION OF HYDROGEN ASSISTED CRACK GROWTH Progress Report, 1 Dec. 1983 - 30 Nov. 1984
S. H. Carpenter 1984 28 p refs
(Contract DE-AC02-81ER-10958)
(DE84-015920; DOE/ER-10958/3) Avail: NTIS HC A03/MF A01

Changes in the elastic modulus of pure iron due to cracking by cathodic charging were related to the density of cracking, the siace of the cracks and the effective depth of cracking. The effects of such variables as vibratory strain amplitude, charging current density, sample size and mode of vibration are reported on. Internal friction measurements complimentary to the modulus measurements are also described. The acoustic emission generated during the pressurization and subsequent pressure holds of small pressure vessels with high pressure hydrogen and helium gas were measured and characterized. To determine the source of emissions various other mechanical tests are performed. Double cantilever beam specimens were tested in different conditions to elucidate the AE from crack growth and to determine effects of hydrogen environments. DOE

N85-11229# Sandia Labs., Albuquerque, N. Mex.
METASTABLE PHASE FORMATION IN ION IMPLANTED METALS
D. M. Follstaedt 1984 26 p refs Presented at Ion Beam Modification of Mater. Conf., Ithaca, N.Y., 16 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-014945; SAND-84-0390C; CONF-840760-2) Avail: NTIS HC A03/MF A01

The formation of metastable phases in metals by ion implantation and ion beam mixing is examined for a variety of conditions. The work reviewed shows that ion beams can produce transformations of the metal host to a different crystalline phase, to a compound, to an amorphous phase, or to combinations of such phases. The observed microstructures are discussed in terms of microscopic mechanisms as well as empirical rules currently being developed. DOE

N85-11230# Bendix Corp., Kansas City, Mo.
ION CHROMATOGRAPHIC DETERMINATION OF GOLD IN PLATING BATHS Quarterly Report
R. E. Smith Aug. 1984 7 p refs
(Contract DE-AC04-76DP-00613)
(DE84-016187; BDX-613-3109) Avail: NTIS HC A02/MF A01

A rapid, reproducible method based on ion chromatography was developed to determine the gold content of plating baths. The gold is complexed with cyanide, and the gold cyanide is detected by ion chromatography. This procedure was automated. The previously used gravimetric procedure required 5 h applied labor per sample. Based on the 13 required analyses each month, the new method generates a time savings of more than 60 h a month. DOE

N85-11231# Titanium Metals Corp. of America, Henderson, Nev.
OPTIMIZATION OF MECHANICAL/CORROSION PROPERTIES OF TICODE-12 PLATE AND SHEET. PART 1: COMPOSITIONAL EFFECTS, STAGE 1 Final Report
R. W. Schutz and J. A. Hall Jul. 1984 128 p refs
(Contract DE-AC04-76DP-00789)
(DE84-015935; SAND-83-7438-Pt-1) Avail: NTIS HC A07/MF A01

The effect of nickel, molybdenum, iron, and oxygen variables were determined on the mechanical and corrosion properties of Ti-Code 12 within the ASTM specification range for Grade 12 titanium. Properties considered for welded and unwelded 0.25 in. (6.35 mm) plate and 0.070 in. (1.78 mm) simulated strip products included strength, ductility, slow bend and impact fracture toughness, bend ductility, general corrosion, and crevice corrosion resistance. The relative influence of these compositional variables on each specific property was evaluated by means of multiple linear regression analysis. Optimized composition ranges for plate and sheet Ti-Code 12 products, produced by a simulated unidirectional mill process, were derived from these results based on assumed sets of property requirements. Author

N85-11232# Pacific Northwest Lab., Richland, Wash.
CRITICAL ASSESSMENT OF LOW FLUENCE IRRADIATION CREEP MECHANISMS
C. H. Henager, Jr. and E. P. Simonen Mar. 1984 44 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984
(Contract DE-AC06-76RL-01830)
(DE84-015578; PNL-SA-12098; CONF-840604-17) Avail: NTIS HC A03/MF A01

A modified climb controlled glide (CCG) creep model, used to rationalize low dose, light ion irradiation creep data in pure nickel, accounted for low fluence irradiation creep rates and loop growth rates in 316 stainless steel was assessed. The model predicted a weak stress dependence and a weak temperature dependence. Light ion and neutron irradiation creep measurements and microstructural observations at low doses were examined and compared with predictions of the CCG model. Calculated creep rates compared to measured creep rates demonstrated that dislocation glide was the dominant mode of deformation during low dose creep when interstitial loops were small. When the interstitial loop radius approached one half the average dislocation glide distance, the dislocation glide contribution was small. The stress induced preferred absorption (SIPA) creep mechanism contributed an increasing fraction of the total deformation as the loop radius increased and became dominant at high fluences. The modified CCG creep model assumes that glissile network dislocation intersect the small dislocation loop glide barriers, climb into a favorable orientation and annihilate the loop via a Burgers vector reaction. Dislocation climb controls the rate of loop annihilation that allows dislocation glide between loop barriers. The creep rate is determined by a balance between irradiation enhanced dislocation climb and interstitial loop growth. DOE

N85-11233# Los Alamos Scientific Lab., N. Mex.
CORROSION IN ALKALI METAL/MOLYBDENUM HEAT PIPES
Lynn B. Lundberg and Roy C. Feber, Jr. 1984 14 p refs Presented at the AIAA 19th Thermophys. Conf., Snowmass, Colo., 25-28 Jun. 1984 Previously announced as A84-46128
(Contract W-7405-eng-36)
(DE84-014039; LA-UR-84-1952; CONF-8406155-1) Avail: NTIS HC A02/MF A01

Molybdenum/sodium (Mo/Na) and molybdenum/lithium (Mo/Li) heat pipes were operated for long periods of time to study their resistance to failure by alkali metal corrosion. Some Mo/Na heat pipes operated over 20,600 h at 1400 K without failure, while at least one similar heat pipe failed in less than 14 hours at 1435 K. Detailed postmortem analyses performed on three failed Mo/Na heat pipes indicated impurity controlled corrosion of their evaporators. Impurities observed to be transported included carbon, oxygen, and silicon. A Mo/Li heat pipe that failed after 25,216 h of operation at 1700 K was also examined. This failure was due to nickel impurities which are transported to the evaporator resulting in perforation of the container tube by the formation of a low melting Mo-Ni alloy. Theoretical thermochemical calculations were conducted for these systems to corroborate the corrosion mechanisms in both types of heat pipes. The results of these calculations are in agreement with the observed corrosion a phenomena. DOE

N85-11234# California Univ., Livermore. Lawrence Livermore Lab.
BIFORM RESOLIDIFICATION AND AMORPHOUS PHASES IN A LASER AND ELECTRON BEAM PROCESSED TANTALUM-IRIDIUM ALLOY
E. N. Kaufmann, R. J. Wallace, K. W. Mahin, C. J. Echer, F. J. Huegel, and C. W. Draper Jun. 1984 7 p refs Presented at MRS European Meeting, Strasbourg, 5 Jun. 1984
(Contract W-7405-eng-48)
(DE84-013334; UCRL-90624; CONF-8406129-2) Avail: NTIS HC A02/MF A01

A 50 at. % Ta/Ir alloy is surface melted by a CW CO2 laser and, in a separate study, by a CW electron beam. Metallographic and transmission electron microscopic analysis reveals both a microcrystalline region and amorphous region and amorphous regions in the resolidified layers. Evidence suggests that amorphous regions of two distinct compositions exist in the laser irradiated case. A two dimensional finite element heat flow analysis is used to estimate cooling rate and resolidification velocities. DOE

N85-11235# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
ENVIRONMENT-INDUCED EMBRITTLEMENT: EFFECT OF IMPURITY SEGREGATION AND STATE OF STRESS Technical Progress Report, 1 Jul. 1983 - 30 Jun. 1984
L. A. Heldt and D. A. Koss 1984 29 p refs
(Contract DE-AC02-81ER-10941)
(DE84-015436; DOE/ER-10941/3) Avail: NTIS HC A03/MF A01

The program involves studies of both hydrogen embrittlement and stress corrosion cracking phenomena and consists of the following research projects: the influence of stress state on the hydrogen embrittlement of Ni sheet; hydrogen embrittlement of spheroidized plain carbon steel under multiaxial stress states; environmentally-assisted fracture under shear loading; studies of surface chemistry near the tips of stress corrosion cracks; stress corrosion of beta and alpha-beta brass; and effect of boundary misorientation on the hydrogen embrittlement of nickel bicrystals. DOE

N85-11236# Denver Univ., Colo. Dept. of Physics.
DETECTION OF HYDROGEN ASSISTED CRACK GROWTH BY MEASUREMENT OF MODULUS CHANGES AND ACOUSTIC EMISSION
S. H. Carpenter, J. Armstrong (Rockwell International Corp., Golden, Colo.), and C. R. Heiple 1984 24 p refs
(Contract DE-AC02-81ER-10958)
(DE84-015752; DOE/ER-10958/T1) Avail: NTIS HC A02/MF A01

The techniques investigated are the precise continuous measurement of changes in the elastic modulus and acoustic emission measurements. A decrease in the elastic modulus should

be observed as cracks nucleate and grow in a test material. Measurements of changes in the elastic modulus while cathodically charging a number of iron base materials both at zero load and under applied load are reported on. In all cases a decrease in the elastic modulus was observed as a result of cathodic charging with hydrogen. The modulus loss was found to be permanent and could not be restored by heat treatment. Acoustic emission measurement were carried out as miniature pressure vessels were pressurized and subsequently held at pressure. Differences in the acoustic emission were observed for vessels pressurized with hydrogen gas as compared to vessels pressurized with helium. Considerably more acoustic emission was generated in vessels pressurized with hydrogen. DOE

N85-11237# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
REVIEW: THE INFLUENCE OF SHORT CIRCUIT DIFFUSION ON THE OXIDATION OF NICKEL, CHROMIUM AND NICKEL/CHROMIUM ALLOYS
H. V. Atkinson Jun. 1984 95 p refs
(AERE-R-11311) Avail: NTIS HC A05/MF A01

The evidence for the importance of short circuit diffusion in the oxidation of nickel, chromium, and nickel/chromium alloys is critically reviewed. Quantitative evidence that outward diffusion of nickel cations through NiO grain boundaries controls the oxidation rate of nickel in the temperature range 500 to 800 C is presented. Supporting qualitative experimental results on oxidation rate anisotropy and the effects of surface preparation are also discussed. Duplex oxide layer formation on Ni may involve inward transport of oxygen via short circuit paths, possibly microcracks. The importance of short circuit diffusion in Cr oxidation can be inferred from the discrepancy between observed oxidation rates and those predicted from measured lattice diffusion coefficients, and from the oxidation rate anisotropy between different grains on etched Cr. Stress generation in NiO and Cr_2O_3 may occur through a mechanism involving short circuit transport; this can have an important influence on the morphology of scales, and on oxidation behavior. R.S.F.

N85-11022*# Deere and Co., Moline, Ill.
LOW-GRAVITY SOLIDIFICATION OF CAST IRON AND SPACE TECHNOLOGY APPLICATIONS
James A. Graham *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 75-81 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11F

N85-11040*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DIRECTIONAL SOLIDIFICATION OF FLAKE AND NODULAR CAST IRON DURING KC-135 LOW-G MANEUVERS
Peter A. Curreri, D. M. Stefanescu (Alabama Univ., University), and J. C. Hendrix (Alabama Univ., University) *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 275-291 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11F

N85-11042*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTAINERLESS DROP TUBE SOLIDIFICATION AND GRAIN REFINEMENT OF NIAl3
Edwin C. Ethridge, Peter A. Curreri, Michael Kelly (Du Pont de Nemours (E. I.) and Co., Wilmington, Del.), Gary Workman (Alabama Univ., Huntsville), Anita Mobely Smith (Alabama Univ., Huntsville), and Robert Bond (Alabama Univ., Huntsville) *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 293-303 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-11238*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
DEFORMATIONS AND STRAINS IN ADHESIVE JOINTS BY MOIRE INTERFEROMETRY
Daniel Post, Robert Czarnek, Judy Wood, Duksung John, and Steven Lubowinski Oct. 1984 44 p ref
(Contract NAG1-227)
(NASA-CR-172474; NAs 1.26:172474) Avail: NTIS HC A03/MF A01 CSCL 11B

Displacement fields in a thick adherend lap joint and a cracked lap shear specimen were measured by high sensitivity moire interferometry. Contour maps of in-plane U and V displacements were obtained across adhesive and adherent surfaces. Loading sequences ranged from modest loads to near-failure loads. Quantitative results are given for displacements and certain strains in the adhesive and along the adhesive/adherend boundary lines. The results show nonlinear displacements and strains as a function of loads or stresses and they show viscoelastic or time-dependent response. Moire interferometry is an excellent method for experimental studies of adhesive joint performance. Subwavelength displacement resolution of a few micro-inches, and spatial resolution corresponding to 1600 fringes/inch (64 fringes/mm), were obtained in these studies. The whole-field contour maps offer insights not available from local measurements made by high sensitivity gages. Author

N85-11239*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN EVALUATION OF GREASE TYPE BALL BEARING LUBRICANTS OPERATING IN VARIOUS ENVIRONMENTS Final Status Report
E. L. McMurtrey Oct. 1984 23 p refs
(NASA-TM-86480; NAS 1.15:86480; FSR-8) Avail: NTIS HC A02/MF A01 CSCL 11H

Because many future spacecraft or space stations will require mechanisms to operate for long periods of time in environments which are adverse to most bearing lubricants, a series of tests has been completed to evaluate 38 grease type lubricants in R-4 size bearings in five different environments for a 1 year period. Four repetitions of each test were made to provide statistical samples. These tests were also used to select four lubricants for 5 year tests in selected environments with five repetitions of each test for statistical samples. In this completed program, 172 test sets have been completed. The three 5 year tests in: (1) continuous operation and (2) start stop operation, with both in vacuum at ambient temperatures, and (3) continuous vacuum operation at 93.3 C have been completed. In both the 1 year and 5 year tests, the best results in all environments have been obtained with a high viscosity index perfluoroalkylpolyether (PFPE) grease. Author

N85-11240# Naval Surface Weapons Center, White Oak, Md.
DETERMINATION OF NONLINEAR VISCOELASTICITY PARAMETERS FOR POLYMERIC AND COMPOSITE MATERIALS BY NUMERICAL METHODS
J. M. Augl and D. J. Land 4 Nov. 1983 46 p
(B0951SB)
(AD-A145311; NSWC/TR-83-470) Avail: NTIS HC A03/MF A01 CSCL 11/4

A Taylor extension of the power law for nonlinear creep and recovery behaviour of polymeric materials was performed. Upon variation of these equations with respect to the parameters a least square method in conjunction with an iterative approach was used to determine the desired parameters. The iteration is stopped after the standard deviation of all experimental points reaches a minimum value. The experimental points were artificially generated by using random numbers which were normally distributed around

the theoretical functional values within a present error band. For each mean error point of a particular parameter 10 different runs were made, such that every time a new set of random numbers was chosen. Thus it was possible to study the sensitivity and the limitations of an experimental approach for determining the nonlinear viscoelastic parameters of the power law representation, derived by Schapery from thermodynamical principles. The same approach would apply to any other form of the creep function which can be expanded into a Taylor series. GRA

N85-11241# Catholic Univ. of America, Washington, D.C.
INVESTIGATION OF CHEMICAL DURABILITY MECHANISMS IN FLUORIDE GLASSES Annual Report, Apr. 1983 - Jun. 1984
C. J. Simmons and J. H. Simmons 10 Aug. 1984 52 p
(Contract N00014-83-K-0276)
(AD-A145420; AR-1) Avail: NTIS HC A04/MF A01 CSCL 11/2

Aqueous corrosion mechanisms are investigated in heavy metal fluoride glasses. The family of glasses based on the Zirconium tetrafluoride glass former is rapidly attacked by water which is either unbuffered or contains acidic components. However, these glasses resist corrosion by basic solutions. ThF4-based glasses exhibit a higher resistance. Comparisons are made between the 2 glass families; pH dependence of corrosion is analyzed and a corrosion model is presented. GRA

N85-11242# Pennsylvania Univ., Philadelphia.
P-DOPING OF (CH)x TO THE METALLIC REGIME WITH GASEOUS OXYGEN. APPLICATION TO OXYGEN FUEL CELL TYPE ELECTRODES Interim Technical Report
R. J. Mammone and A. G. MacDiarmid May 1984 26 p
(Contract N00014-83-K-0209)
(AD-A145477; TR-84-5) Avail: NTIS HC A03/MF A01 CSCL 11/9

Trans-polyacetylene, (CH)x, can be p-doped (oxidized) to the metallic regime by gaseous oxygen in the presence of an aqueous solution of a non-oxidizing acid such as HBF4. The oxygen oxidizes the (CH)x to (CH(+y))x while the HBF4 supplies a stable fluoroborate counter anion to give a species such as (CH(+y)A(-y)x. The doping process is consistent with the reduction potentials of (CH)x and O2 in acid solution. In the absence of the acid, oxygen reacts irreversibly with the semiconducting (CH)x to destroy its conductivity. GRA

N85-11243# Pennsylvania Univ., Philadelphia. Dept. of Chemistry.
THE CONCEPT OF DOPING OF CONDUCTING POLYMERS. THE ROLE OF REDUCTION POTENTIALS
A. G. MacDiarmid, R. J. Mammone, R. B. Kaner, and S. J. Porter Jul. 1984 34 p Presented at the Royal Soc. Meeting, Magnetic and Elec. Effects in Low Dimensional Solids, 31 May 1984
(Contract N00014-83-K-0209)
(AD-A145480; TR-84-8) Avail: NTIS HC A03/MF A01 CSCL 11/9

The conductivity of certain organic polymers can be raised to the metallic regime by chemical or electrochemical p-doping (oxidation), or n-doping (reduction). Polyacetylene, (CH)x, the prototype conducting polymer, has been studied more extensively than any other conducting polymer and the doping concepts involved appear to be applicable to the other polymer systems. The doping of an organic polymer to the metallic regime is phenomenologically similar to the doping of a classical inorganic semiconductor in that very large increases in conductivity are observed when the material takes up very small amounts of certain chemical species. However, mechanistically it is different in that the doping of an organic polymer involves simply the partial oxidation or reduction of the polymer, each oxidation state exhibiting its own characteristic reduction potential. The dopant ion incorporated may be derived from the chemical dopant species or it may be completely unrelated to it. GRA

N85-11244# Carnegie-Mellon Univ., Pittsburgh, Pa.
PHYSICAL-CHEMICAL PROPERTIES OF ARTICULATED RODLIKE POLYMERS Final Report, 1 Mar. 1982 - 30 Aug. 1983
G. C. Berry, R. Furukawa, S. Mohan, and C. Wei Wright-Patterson AFB, Ohio AFWAL Apr. 1984 330 p
(Contract F33615-81-K-5043)
(AD-A145549; AFWAL-TR-84-4033) Avail: NTIS HC A15/MF A01 CSCL 11/9

The properties of PBT, articulated copolymers of PBT (SPBT), and PBO (SPBO), and copolymers of PBT and PBO in dilute solutions are discussed. Light scattering methods are used to determine the molecular weight, the second virial coefficient, the root-mean-square radius of gyration, and a hydrodynamic radius. Photon correlation scattering is used to determine the other parameters. The anisotropic light scattering is used to determine an optical molecular anisotropy which provides information on the rodlike nature of the chain. GRA

N85-11245# Akron Univ., Ohio. Inst. of Polymer Science.
THE ROLE OF MOLECULAR DIFFUSION IN THE ADHESION OF ELASTOMERS
M. D. Ellul and A. N. Gent Sep. 1984 54 p
(Contract N00014-76-C-0408)
(AD-A145576; TR-34) Avail: NTIS HC A04/MF A01 CSCL 11/1

Butyl rubber (polyisobutylene-co-isoprene) mixed with polyisobutylene was crosslinked to yield elastomeric macromolecular networks containing dissolved linear macromolecules. Adhesion of these materials to themselves (self-adhesion) and to an inert substrate was investigated over a wide range of peel rates and test temperatures. Greatly enhanced self-adhesion was found when linear polyisobutylene molecules of high molecular weight were present, but the strength of adhesion to a rigid inert substrate was hardly affected. GRA

N85-11246# Akron Univ., Ohio. Inst. of Polymer Science.
MECHANOCHEMICAL REACTIONS OF ELASTOMERS WITH METALS Technical Report
A. N. Gent and W. R. Rodgers Sep. 1984 42 p
(Contract N00014-76-C-0408)
(AD-A145657; TR-33) Avail: NTIS HC A03/MF A01 CSCL 11/10

Metal powders have been incorporated into various elastomers and the mixtures subjected to intense shearing in either an air or a nitrogen atmosphere. The molecular weight after shearing was still relatively high, however, greater than 100 kg/mole. The elastomer was then dissolved and centrifuged to remove the metal particles, and the solution was then analyzed to remove the metal particles, and the solution was then analyzed for reaction products. A strongly-UV absorbing species was formed by shearing a styrene-butadiene copolymer (SBR) with iron powder. The concentration increased with both the concentration of iron powder in the mixture and with the extent of shearing, and it was greater for shearing in a nitrogen atmosphere. These results are attributed to direct reaction of macromolecular radicals, formed by shearing, with the iron powder to yield an iron-polymer compound. GRA

N85-11247# Naval Weapons Center, China Lake, Calif.
A NEW HEAT-RESISTANT POLYMER FROM DIMER DIAMINE BISMALEIMIDE. PART 1: PREPARATION AND FREE RADICAL CURE OF DIMER DIAMINE BISMALEIMIDE Interim Report, 1 Oct. 1982 - 29 Feb. 1984
A. A. DeFusco, A. L. Woodman, E. C. Martin, and M. P. Nadler Jul. 1984 27 p
(AD-A145664; NWC-TP-6543) Avail: NTIS HC A03/MF A01 CSCL 11/9

The preparation and free radical cure of the bismaleimide of dimer diamine is described where the polymer shows excellent thermal stability comparable to the aromatic substituted bismaleimide counterparts. An improved process for making the monomeric bismaleimide of dimer diamine provides good yields of highly pure material. Contamination by polymer or other by-products commonly encountered is eliminated by a process that uses N,N'-dicyclohexylcarbodiimide hydroxybenzotriazole co-reagents for cyclodehydration of the precursor bismaleamic acid of dimer

diamine. Purification of the crude product can be accomplished by chromatography. GRA

N85-11248# SRI International Corp., Menlo Park, Calif.
SILICON NITRIDE JOINING Annual Report, 1 Feb. 1983 - 31 Mar. 1984
S. M. Johnson and D. J. Rowcliffe May 1984 77 p
(Contract F49620-81-K-0001)
(AD-A145668; AFOSR-84-0778TR) Avail: NTIS HC A05/MF A01 CSCL 11/2

The results obtained in the third year of a continuing investigation into a method of joining silicon nitride with an oxide glass are described. Mechanical behavior of joints at room temperature and the criteria for strong joints are detailed. Two approaches were taken to strengthen the joints: heat treatments to crystallize the glass in the joint and surface preparation. The high temperature behavior of various Si3N4/glass systems was investigated by means of high temperature mechanical tests, mass spectrometry, theoretical calculations, and mass transport studies. GRA

N85-11249# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
FACTOR ANALYSIS APPLIED TO A SILANE COUPLING AGENT ON E-GLASS FIBER SYSTEM
S. R. Culler, H. Ishida, and J. L. Koenig 24 Aug. 1984 32 p
(Contract N00014-80-C-0533)
(AD-A145687; CWRU/DMS/TR-14) Avail: NTIS HC A03/MF A01 CSCL 11/7

The system gamma-aminopropyltriethoxysilane coupling agent on E-glass mats has been analyzed by the use of factor analysis to determine the number of pure components and extract the pure component spectra; improve the signal-to-noise (S/N) ratio of the collected spectra; and determine the concentration of unknown mixtures. Normalization of the scaling coefficients allows the construction of a calibration curve for the determination of the treating solution concentration by examining the silane coupling agent on the glass mats. Author (GRA)

N85-11250# Pacific Northwest Lab., Richland, Wash.
CERAMIC MATERIALS FOR MHD ELECTRODES
D. D. Marchant Jun. 1984 13 p refs Presented at 22nd Symp. on Engr. Aspects of MHD, State College, Miss., 24 Jun. 1984
(Contract DE-AC06-76RL-01830)
(DE84-015580; PNL-SA-12230; CONF-840667-5) Avail: NTIS HC A02/MF A01

Compositions containing In2O3-SnO2 were studied as additives to refractory ceramic oxides for increased electrical conductivity. The electrical conductivity of In2O3-SnO2 compositions increases with increasing In2O3 concentration and reaches a maximum with compositions containing about 95 mol% In2O3. These high In2O3-containing compositions behave like degenerate semiconductors; the electrical conductivity decreases with increasing temperature. Three major crystallographic phases were identified for each composition. These phases were tested for their relative electrical conductivity and corrosion resistance, to determine which phase would be most suitable for use as an additive. DOE

N85-11251# Los Alamos Scientific Lab., N. Mex.
KINETICS OF SHORT-RANGE ORDERING IN METALLIC GLASSES: ANALYSIS OF THE CROSSOVER EFFECT
J. T. Stanley and J. R. Cost 1984 5 p refs Presented at 5th Intern. Conf. on Rapidly-Quenched Metals, Wurzburg, West Germany, 3 Sep. 1984
(Contract W-7405-eng-36)
(DE84-015524; LA-UR-84-2350) Avail: NTIS HC A02/MF A01

Model calculations were carried out for two different relaxation time spectra to simulate the relaxation curves that would be obtained for crossover experiments and other types of isothermal anneal sequences that give rise to inhomogeneous states of order. It is concluded that although the crossover effect clearly demonstrates the existence of more than a single relaxation process the response curve obtained in the crossover experiment tends to smear out the details of the relaxation time spectrum. DOE

N85-11020*# Missouri Univ., Rolla.
POTENTIAL UTILIZATION OF GLASS EXPERIMENTS IN SPACE
Norbert J. Kreidl *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 66-73 refs Prepared in cooperation with New Mexico Univ., Albuquerque and Santa Fe Coll., New Mex. (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11B

N85-11021*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PREPARATION OF LARGE-PARTICLE-SIZE MONODISPERSE LATEXES IN SPACE: THE STS-3, STS-4, AND STS-7 MISSION RESULTS Abstract Only
John W. Vanderhoff, M. S. El-Aasser, F. J. Micale, E. D. Sudol, C. M. Tseng, A. Silwanowicz, and D. M. Kornfeld *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 75 Prepared in cooperation with Lehigh Univ., Bethlehem, Pa. (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 11G

N85-11199# Annawerk Keramische Betriebe G.m.b.H., Roedental (West Germany). Ceranox Div.
NON-OXIDE CERAMICS: A NEW CLASS OF ENGINEERING MATERIALS Abstract Only
E. Gugel *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 47 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-11252*# United Technologies Research Center, East Hartford, Conn.
EXTERNAL FUEL VAPORIZATION STUDY, PHASE 2 Interim Report
E. J. Szetela and L. Chiappetta Jan. 1981 27 p refs
(Contract NAS3-21971)
(NASA-CR-174079; NAS 1.26:174079; R81-915326-5) Avail: NTIS HC A03/MF A01 CSCL 21D

An analytical study was conducted to evaluate the effect of variations in fuel properties on the design of an external fuel vaporizaton system. The fuel properties that were considered included thermal stability, critical temperature, enthalpy a critical conditions, volatility, and viscosity. The design parameters that were evaluated included vaporizer weight and the impact on engine requirement such as maintenance, transient response, performance, and altitude relight. The baseline fuel properties were those of Jet A. The variation in thermal stability was taken as the thermal stability variation for Experimental Referee Broad Specification (ERBS) fuel. The results of the analysis indicate that a change in thermal stability equivalent to that of ERBS would increase the vaporization system weight by 20 percent, decrease oprating time between cleaning by 40 percent and make altitude relight more difficult. An increase in fuel critical temperature of 39 K would require a 40 percent increase in vaporization system weight. The assumed increase in enthalpy and volatility would also increase vaporizer weight by 40 percent and make altitude relight extremely difficult. The variation in fuel viscosity would have a negligible effect on the design parameters. R.S.F.

N85-11253# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
FLARES AND PHOTOFLASH ITEMS Final Report
27 Aug. 1984 14 p Supersedes MTP-4-2-130 dated 23 Nov. 1970

(AD-A145442; TOP-4-2-130; MTP-4-2-130) Avail: NTIS HC A02/MF A01 CSCL 19/1

This document describes engineering tests of aircraft flares, surface flares, and photoflash cartridges. The procedures are also suitable for military potential tests, initial production tests, etc. Test phases include safety tests, environmental and handling tests, and performance tests. These test procedures do not apply to photoflash bombs or illuminating projectiles fired from artillery weapons or mortars. GRA

N85-11254# Monsanto Co., Dayton, Ohio. Dayton Lab.
VARIABILITY OF MAJOR ORGANIC COMPONENTS IN AIRCRAFT FUELS. VOLUME 3: SAMPLE DATA PACKAGE FOR THE REFERENCE JP-4 FUEL Interim Report, Dec. 1982 - Nov. 1983
B. M. Hughes, G. G. Hess, K. Simon, S. Mazer, and W. D. Ross 27 Jun. 1984 84 p 3 Vol.
(Contract F08635-83-C-0067)
(AD-A145483; AFESC/ESL-TR-84-02-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 21/4

This report summarizes qualitative and quantitative data on the chemical variability of approximately 300 features (chemical components or mixtures of components) with concentrations greater than 0.1 mg/ml in Air Force distillate fuels obtained from over 50 sources. These data were obtained to better understand the environmental effects of possible fuel spills and to serve as a data baseline in photochemical smog an soot formation studies. Fifty-four petroleum-derived JP-4 fuels, one shale-derived JP-4 fuel, and one petroleum-derived JP-5 fuel were analyzed. GRA

N85-11255# Ohio State Univ., Columbus.
MOLECULAR INTERACTIONS OF HIGH ENERGY FUELS AND JET FUELS WITH ONCOGENIC VIRUSES AND ENDOGENOUS VIRUSES Final Report, 1 Jul. 1980 - 30 Sep. 1983
J. R. Blakeslee, Jr. May 1984 147 p
(Contract F49620-80-C-0087)
(AD-A145484; AFOSR-84-0720TR) Avail: NTIS HC A07/MF A01 CSCL 06/20

The objectives of this research were to develop rapid in-vitro assays, to evaluate the carcinogenic potential of chemicals used by the U.S. Air Force. Snyder-Theilen Feline Sarcoma Virus (ST-FeSV), quantitatively transforms human skin fibroblasts following second order kinetics. These studies were performed in order to determine whether chemicals altered ST:FeSV transformation in a predictable manner and to correlate the alteration with the carcinogenic or non-carcinogenic activity of the test chemical. The results, to date, show diverse carcinogens classed as: aromatic amines, polycyclic hydrocarbons, aminofluorenes, hydrazines, asbestos and mycotoxins inhibited virus transformation when virus infected cells (2 hours post-infection) were exposed to test chemical, while non-carcinogenic chemicals had no significant effect on transformation. Triton X-100, acetone, petroleum and shale oil derived JP5; RJ5 and diesel fuel, marine, demonstrated non-carcinogenic activity while formalin demonstrated carcinogenic activity. Experiments designed to show the specificity of the antagonistic effect of known carcinogens are reported. GRA

N85-11256# Monsanto Research Corp., Dayton, Ohio.
VARIABILITY OF MAJOR ORGANIC COMPONENTS IN AIRCRAFT FUELS. VOLUME 1: TECHNICAL DISCUSSION Interim Report, Dec. 1982 - Nov. 1983
B. M. Hughes, G. G. Hess, K. Simon, S. Mazer, and W. D. Ross Tyndall AFB, Fla. Air Force Engineering and Services Center 27 Jun. 1984 76 p
(Contract F08635-83-C-0067)
(AD-A145574; AFESC/ESL-TR-84-02-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 21/4

This report summarizes qualitative and quantitative data on the chemical variability of approximately 300 features (chemical components or mixtures of components) with concentrations greater than 0.1 mg/ml in Air Force distillate fuels obtained from over 50 sources. These data were obtained to better understand the environmental effects of possible fuel spills and to serve as a data baseline in photochemical smog and soot formation studies. Fifty-four petroleum-derived JP-4 fuels, one shale-derived JP-4 fuel, and one petroleum-derived JP-5 fuel were analyzed. The variability of the absolute concentrations in mg/ml was assessed for each feature in the capillary GC/FID (gas chromatography/flame-ionization detection) analysis of the 54 fuels. GRA

N85-11257# Naval Weapons Center, China Lake, Calif.
THE 7-AMINO-4,6-DINITROBENZOFUROXAN, AN INSENSITIVE HIGH EXPLOSIVE Final Report
W. P. Norris Jun. 1984 18 p
(AD-A145665; NWC-TP-6522) Avail: NTIS HC A02/MF A01 CSCL 19/1

7-Amino-4,6-dinitrobenzofuroxan is an insensitive explosive (equal to TNT in impact sensitivity) with a calculated detonation velocity equal to that of TATB. A simple synthesis route is described. The position of the amino group is proved by reduction with triphenyl-phosphine to give 7-amino-4,6-dinitrobenzofurazan, a known compound. A by-product isolated from the reduction reaction is 2-(triphenylphosphinimido)-4,6-dinitroaniline.
Author (GRA)

N85-11258# Pratt and Whitney Aircraft of Canada Ltd., Mississauga (Ontario).
ALTERNATE FUELS COMBUSTION RESEARCH Final Report, May 1980 - Sep. 1983
M. Gratton, I. Critchley, and P. Sampath Wright-Patterson AFB, Ohio AFWAL Jul. 1984 360 p
(Contract F33616-80-C-2002)
(AD-A145691; AFWAL-TR-84-2042; AFESC/ESL-TR-84-29) Avail: NTIS HC A16/MF A01 CSCL 21/4

This report presents the results of the Alternate Fuels Combustion Research program. The effects of variations in fuel properties on the performance of a can, PT6A-65, and JT15D-5 combustion systems were determined. Sixteen different fuels were used, encompassing a wide range of chemical and physical properties. The tests covered current specification, broadened specification and alternate source (shale and tar sands derived) fuels. Author (GRA)

N85-11259# California Univ., Livermore. Lawrence Livermore Lab.
RESPONSE OF PROPELLANTS TO HIGH DYNAMIC STRESSES: THE USES OF GUN LAUNCH TECHNIQUES
E. L. Lee, James E. Green, W. VonHolle, C. Tarver, D. Curran (SRI International), W. Murri (SRI International), and D. Seaman (SRI International) 28 Feb. 1984 33 p refs Presented at the AGARD Advisory Group for Aerospace Res. and Develop., Lisse, Netherlands, 30 May - 1 Jun. 1984
(Contract W-7405-eng-48)
(DE84-013223; UCRL-88773; CONF-8405202-1) Avail: NTIS HC A03/MF A01

High energy propellants which are subjected to sufficiently high stresses and high stress rates will ignite and begin to release chemical energy are discussed. The ensuing response can vary from mild reaction to high order detonation. Experimental and calculation effort were made to understand, predict, and modify this response. Experimental work which uses guns to impact flat plates on oriented propellant samples is emphasized. Such experiments offer special advantages from both experimentalist's and analyst's point of view because of accessibility of diagnostics and because of simpler geometry. DOE

N85-11782# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF BURNOUT OF SOLID FUEL IN FLUIDIZED BED OF FINELY DIVIDED INERT PARTICLES Abstract Only
A. P. Baskokov, V. A. Munts, and A. A. Ashikhmin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 99 Transl. into ENGLISH from Fiz. Foreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 60-62 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-11260 British Library Lending Div., Boston Spa (England).
CALCULATION OF THE OPTIMUM CONDITIONS FOR THE FORGING OF PLATES
O. M. Smirnov and I. A. Akmulin [1984] 3 p refs Transl. into ENGLISH from Izv. Vyssh Ucheb Zaved (USSR), no. 11 p 164 (BLL-M-35757-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The ideal conditions for the forging of plates is determined by taking into account factors of pressure, deformation and configuration of equipment. Author

N85-11261*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLASMA VARIABLES AND TRIBOLOGICAL PROPERTIES OF COATINGS IN LOW PRESSURE (0.1 - 10.0 TORR) PLASMA SYSTEMS
R. Avni (Ben Gurion Univ. of the Negev) and T. Spalvins 1984 30 p refs Presented at the 11th Intern. Conf. on Met. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by the American Vacuum Society
(NASA-TM-83798; E-2238; NAS 1.15:83798) Avail: NTIS HC A03/MF A01 CSCL 11G

A detailed treatment is presented of the dialog known as plasma surface interactions (PSI) with respect to the coating process and its tribological behavior. Adsorption, morphological changes, defect formation, sputtering, chemical etching, and secondary electron emission are all discussed as promoting and enhancing the surface chemistry, thus influencing the tribological properties of the deposited flux. Phenomenological correlations of rate of deposition, flux composition, microhardness, and wear with the plasma layer variables give an insight to the formation of chemical bonding between the deposited flux and the substrate surface. B.W.

N85-11262# Northeastern Univ., Boston, Mass.
ASYNCHRONOUS DISCRETE CONTROL OF CONTINUOUS PROCESSES Annual Report, 1 Jul. 1983 - 30 Jun. 1984
M. E. Kaliski and T. L. Johnson 30 Jul. 1984 12 p
(Contract F49620-82-C-0080)
(AD-A145570; AFOSR-84-0654TR) Avail: NTIS HC A02/MF A01 CSCL 09/3

The research during this second contract year continued to deal with the development of sound theoretical models for asynchronous systems. Two criteria served to shape the research pursued: the first, that the developed models extend and generalize previously developed research for synchronous discrete control; the second, that the models explicitly address the question of how to incorporate system transition times into themselves. The following sections of this report concisely delineate this year's work. Our original proposal for this research identified four general tasks of investigation: (1.1) Analysis of Qualitative Properties of Asynchronous Hybrid Systems; (1.2) Acceptance and Control for Asynchronous Hybrid Systems. GRA

N85-11263# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
COMPUTER AIDED PROCESS PLANNING OF MACHINED METAL PARTS Final Technical Report
W. W. Olson Sep. 1984 33 p
(AD-A145628; ARLCB-TR-84027) Avail: NTIS HC A03/MF A01 CSCL 13/8

Although process planning is more of an art than a science today, its automation is both possible and feasible. Variant computer aided systems exist and can be applied now. These systems should not have a great effect upon organizational structure. Generalized generative process planning does not exist and probably will not in the near future. However, several special purpose generative systems are available in experimental form. The capabilities of these systems must be planned during the design by a judicious choice of approaches and properties to solve the process planning problem. Currently, generative systems should be designed for a specific plant or for specific processes. A generative system, if employed, must be considered in the overall scope of computer integrated manufacturing as it needs data existing in other data bases and it has potential organizational impact. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-11264*# Foldes, Inc., Wayne, Pa.
RF CHARACTERISTICS OF THE HOOP COLUMN ANTENNA FOR THE LAND MOBILE SATELLITE SYSTEM MISSION Final Report
Peter Foldes Washington NASA Nov. 1984 65 p refs
(Contract NAS1-17209)
(NASA-CR-3842; NAS 1.26:3842) Avail: NTIS HC A04/MF A01 CSCL 20N

A communication system using a satellite with a 118 meter diameter quad aperture antenna to provide telephone service to mobile users remotely located from the large metropolitan areas where the telephone companies are presently implementing their cellular system is described. In this system, which is compatible with the cellular system, the mobile user communicates with the satellite at UHF frequencies. The satellite connects him at S-Band, to the existing telephone network via a base station. The results of the RF definition work for the quad aperture antenna are presented. The elements of the study requirements for the LMSS are summarized, followed by a beam topology plan which satisfies the mission requirements with a practical and realiable configuration. The geometry of the UHF antenna and its radiation characteristics are defined. The various feed alternatives, and the S-band aperture are described. E.A.K.

N85-11265*# Illinois Univ., Urbana-Champaign. Electromagnetics Lab.
THE STUDY OF MICROSTRIP ANTENNA ARRAYS AND RELATED PROBLEMS Semiannual Report, 22 May - 21 Nov. 1984
Y. T. Lo 19 Nov. 1984 42 p refs Sponsored in part by AF
(Grant NAG3-418)
(NASA-CR-174054; NAs 1.26:174054) Avail: NTIS HC A03/MF A01 CSCL 20N

The physical layout of the array elements and the proximity of the microstrip feed network makes the input impedance and radiation pattern values dependent upon the effects of mutual coupling, feedline discontinuities and feed point location. The extent of these dependences was assessed and a number of single patch and module structures were constructed and measured at an operating frequency of approximately 4.0 GHz. The empirical results were compared with the ones which were theoretically predicted by the cavity model of thin microstrip antennas. Each element was modelled as an independent radiating patch and each microstrip feedline as an independent, quasi-TEM transmission line. The effects of the feedline discontinuities are approximated by lumped L-C circuit models. E.A.K.

N85-11266# Royal Signals and Radar Establishment, Malvern (England).
ESTIMATION OF TARGET POSITIONING USING PLANAR ARRAYS
A. R. Webb Mar. 1984 21 p refs
(RSRE-MEMO-3675; BR92463) Avail: NTIS HC A02/MF A01

Estimation of target position using planar arrays is discussed. For high signal-to-noise ratio, an analytic expression for the rms error in position is derived as a function of the array properties.

This is evaluated for various array configurations and it is shown to be approximately constant across the plane of the array. Comparisons are made with arrays in which only pairs of elements are used to estimate position, and it is shown that this may lead to a degradation in performance. Author (ESA)

N85-11267# Royal Signals and Radar Establishment, Malvern (England).
ROYAL SIGNALS AND RADAR ESTABLISHMENT SPEECH DATABASE RECORDINGS 1984: PART 2: RECORDINGS MADE FOR AUTOMATIC SPEECH RECOGNITION ASSESSMENT AND RESEARCH
M. J. Russell, R. K. Moore, M. J. Tomlinson, and J. C. A. Deacon May 1984 25 p refs
(RSRE-84008-Pt-2; BR92435) Avail: NTIS HC A02/MF A01

A data base of speech recordings was compiled using 5 female and 10 male speakers from England. It is hoped that the data base can be used to provide a standard calibrated test for automatic speech recognition equipment. The minimally contrasting pairs of rhyming words in the data base make the recordings applicable to the development of advanced speech recognition algorithms. Author (ESA)

N85-11268# Naval Ocean Systems Center, San Diego, Calif.
A RADAR SEA CLUTTER MODEL FOR ATMOSPHERIC DUCTING CONDITIONS Final Report, Oct. 1979 - Dec. 1983
F. P. Snyder 31 Jul. 1984 41 p
(WR0-2101)
(AD-A145321; NOSC/TD-721) Avail: NTIS HC A03/MF A01 CSCL 17/4

The Integrated Refractive Effects Prediction System (IREPS) should consider sea clutter effects under atmospheric ducting conditions. The IREPS, undergoing research and development at Naval Ocean Systems Center (NOSC), is intended to provide a shipboard environmental data processing and display capability to assess refractive effects of the lower atmosphere for naval EM systems. Although intended to be incorporated eventually as a part of the Tactical Environment Support System (TESS), the IREPS is currently configured as an interim version based on a Hewlett-Packard 9845 desktop calculator. A comprehensive discussion of the IREPS capabilities is presented by Hitney et al. (1981), while a discussion of the IREPS propagation models is presented by Hattan (1982). GRA

N85-11269# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLURIBUS SATELLITE IMP (INTERFACE MESSAGE PROVISION) DEVELOPMENT MOBILE ACCESS TERMINAL NETWORK Quarterly Technical Report, 1 Nov. 1983 - 31 Jan. 1984
Feb. 1984 39 p
(Contracts MDA903-80-C-0353; N00039-81-C-0408)
(AD-A145348; BBN-5580; QTR-32) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Quarterly Technical Report describes work on the development of Pluribus Satellite IMPs: and on shipboard satellite communications. Author (GRA)

N85-11270# Air Force Geophysics Lab., Hanscom AFB, Mass.
THERMOSONDE AND UHF RADAR MEASUREMENTS OF C2 SUB N AT WESTFORD, MASSACHUSETTS - JULY 1981 Environmental Research Papers
J. H. Brown and R. E. Good 23 Feb. 1984 55 p
(AD-A145398; AFGL-TR-84-0109; AFGL-ERP-876) Avail: NTIS HC A04/MF A01 CSCL 17/9

Five different instruments were used in coordinated multiple experiments to measure atmospheric turbulence. C sub n squared, the optical refractive structure constant, was measured by thermosondes, UHF radar, stellar scintillometer, and aircraft mounted micro-thermal probes. Presented here are the results of 19 rawinsode flights. Also comparisons of eight thermosonde/radar profiles, one radar, scintillometer, thermosonde profile, and several aircraft profiles are presented. For the scales discussed here, good agreement is shown between radar, thermosonde, and scintillometer data. Worse agreement is obtained from aircraft measurements. A diurnal shift in the C2 profile is noted but no tropopause enhancement is found. GRA

N85-11271# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TIMING PERFORMANCE OF PHASE-LOCKED LOOPS IN OPTICAL PULSE POSITION MODULATION COMMUNICATION SYSTEMS M.S. Thesis
D. A. Lafaw 1984 105 p
(AD-A145403; AFIT/CI/NR-84-62T) Avail: NTIS HC A06/MF A01 CSCL 17/2

In an optical digital communication system, an accurate clock signal must be available at the receiver to provide proper synchronization with the transmitted signal. Phase synchronization is especially critical in M-ary pulse position modulation (PPM) systems where the optimum decision scheme is an energy detector which compares the energy in each of M time slots to decide which of M possible words was sent. A timing error causes energy spillover into adjacent time slots (a form of intersymbol interference) so that only a portion of the signal energy may be attributed to the correct time slot. This effect decreases the effective signal, increases the effective noise, and increases the probability of error. This report simulates a timing subsystem for a satellite-to-satellite optical PPM communication link. The receiver employs direct photodetection, preprocessing of the optical signal, and a phase-locked loop for timing synchronization. The photodetector output is modeled as a filtered, doubly stochastic Poisson shot noise process. The variance of the relative phase error is examined under varying signal strength conditions as an indication of loop performance, and simulation results are compared to theoretical relations. Author (GRA)

N85-11272# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
RADAR, TARGET AND RANGING Final Report, on Test Operations Procedure
7 Sep. 1984 16 p Revised
(AD-A145407; TOP-6-2-222) Avail: NTIS HC A02/MF A01 CSCL 17/9

This Test Operations Procedure (TOP) provides conventional test methods employing conventional test instrumentation for testing conventional radars. Single tests and subtests designed to test radar components, transmitters, receivers, antennas, etc., and system performance are conducted with single item instruments such as meters, generators, attenuators, counters, oscillators, plotters, etc., and with adequate land areas for conducting field tests. Author (GRA)

N85-11273# Army Construction Engineering Research Lab., Champaign, Ill.
LABORATORY EVALUATION OF ELECTROMAGNETIC PULSE (EMP) HARDNESS TESTING CONCEPTS FOR ELECTRICAL CONDUIT SYSTEMS Final Report
P. H. Nielsen Aug. 1984 36 p
(AD-A145466; CERL-TR-M-350) Avail: NTIS HC A03/MF A01 CSCL 20/14

Four concepts were evaluated for potential use in testing the electromagnetic shielding integrity of metal conduits: the Hall effect, standing wave coupling, microwave resonant cavity, and diffusion current-leakage current comparison. Existing technology for hardness verification and defect location was reviewed for comparison with the new methods. Because of the phenomena involved, the four concepts are mainly for use with nonburied conduits. In addition, each method has its prospective application limited by one or more drawbacks to implementation: Hall effect devices require direct access to the conduit system and are subject to geometry-dependent variables; with standing wave coupling tests, it may be difficult to maintain a transmission line configuration for the conduit system; the microwave resonant cavity method also requires direct access to the conduit and its greatest potential is for testing of specific conduit components; low frequency phase comparison only verifies hardness, so defects must be located by another test. None of the new methods can be recommended without further development and field evaluation. GRA

N85-11274# Naval Research Lab., Washington, D. C.
RADIOFREQUENCY AND MICROWAVE RADIATION Final Report
K. J. King 9 Aug. 1984 15 p
(AD-A145492; AD-E000595; NRL-MR-5403) Avail: NTIS HC A02/MF A01 CSCL 06/18

The results of a literature review on radiofrequency (RF) and microwave radiation safety are given. This review highlights the most recent information on sources and applications of RF and microwave radiation, biological effects, RF and microwave radiation protection standards, and a brief overview of the Health Physics Staff's non ionizing radiation safety program. GRA

N85-11275# Naval Research Lab., Washington, D. C.
THROUGHPUT INCREASE IN FREQUENCY HOPPED MULTIPLE ACCESS CHANNELS BY MEANS OF DISCRIMINATION AGAINST PARTIALLY OVERLAPPING INTERFERENCE
J. E. Wieselthier and A. Ephremides 30 Aug. 1984 72 p
(RR0-2105)
(AD-A145540; AD-E000593; NRL-MR-5424) Avail: NTIS HC A04/MF A01 CSCL 17/2

In this report we derive the probability of correct packet reception and the resulting channel throughput achievable in an asynchronous slow-frequency-hopped multiple user channel. Reed-Solomon coding is used to correct errors caused by other-user interference in an otherwise noiseless channel. We analyze and evaluate an M-ary FSK signaling scheme, which permits the discrimination against interfering signals that are present for a sufficiently small fraction of the hop duration, and results in substantial increases in channel throughput over previous models. Author (GRA)

N85-11276# Naval Research Lab., Washington, D. C.
IDENTIFICATION AS A FUNCTION OF FAMILIARITY FOR KNOWN VOICES TALKING OVER AN UNPROCESSED CHANNEL AND AN LPC (LINEAR PREDICTIVE CODING) VOICE PROCESSOR Memorandum Report, Nov. 1982 - Mar. 1984
A. Schmidt-Nielsen and K. R. Stern 16 Jul. 1984 36 p
(X09-19)
(AD-A145545; AD-E000591; NRL-MR-5382) Avail: NTIS HC A03/MF A01 CSCL 05/8

A commonly cited drawback of narrowband systems such as the DoD standard linear predictive coding (LPC) algorithm is that speaker recognition is poor. Yet it is the opinion of many users that they frequently recognize the speaker. Tape recordings of 24 speakers conversing over an unprocessed channel and over an LPC voice processing system were subjected to listening tests. Twenty-four co-workers listened to the tapes and attempted to identify each speaker from a list of about 40 people in the same branch. Prior to the recognition tests, each of the listeners also rated his or her familiarity with each of the speakers and the distinctiveness of each speaker's voice. There was some loss in voice recognition over LPC, but the recognition rate was still quite high. Unprocessed voices were correctly identified 88% of the time, whereas the same people talking over the LPC system were correctly identified 69% of the time. Talker familiarity was significantly correlated with correct identifications. There was no significant correlation between the rated distinctiveness of the speaker and correct identifications. However, familiarity and distinctiveness ratings were highly correlated. GRA

N85-11277# Haskins Labs., Inc., New Haven, Conn.
STATUS REPORT ON SPEECH RESEARCH. A REPORT ON THE STATUS AND PROGRESS OF STUDIES ON THE NATURE OF SPEECH, INSTRUMENTATION FOR ITS INVESTIGATION, AND PRACTICAL APPLICATIONS Interim Scientific Report, 1 Jan. - 30 Jun. 1984
A. M. Liberman Aug. 1984 221 p
(Contracts N00014-83-K-0083; PHS-N01-HD-1-2420; Grants NSF BNS-81-11470; PHS-HD-01994; PHS-HD-16591; PHS-RR-05596; PHS-NS-13870; PHS-NS-13617; PHS-NS-18010)
(AD-A145585; SR-77/78(1984)) Avail: NTIS HC A10/MF A01 CSCL 17/2

This report (1 January-30 June) is one of a regular series on the status and progress of studies on the nature of speech, instrumentation for its investigation, and practical applications. Manuscripts cover the following topics: Sources of variability in early speech development; Invariance: Functional or descriptive?; Brief comments on invariance in phonetic perception; Phonetic category boundaries are flexible; On categorizing asphasic speech errors; Universal and language particular aspects of vowel-to-vowel coarticulation; Functional specific articulatory cooperation following jaw perturbation; during speech: Evidence for coordinative structures; Formant integration and the perception of nasal vowel height; Relative power of cues: FO shifts vs. voice timing; Laryngeal management at utterance-internal word boundary in American English; Closure duration and release burst amplitude cues to stop consonant manner and place of articulation; Effects of temporal stimulus properties on perception of the (sl)-(spl) distinction; The physics of controlled conditions: A reverie about locomotion; On the perception of intonation from sinusoidal sentences; Speech Perception; Speech Articulation; Motor Control; Speech Development. GRA

N85-11278# California Univ., Los Angeles. Integrated Electromagnetic Lab.
A GENERALIZED SOLUTION TO A CLASS OF PRINTED CIRCUIT ANTENNAS Ph.D. Thesis
P. B. Katehi-Tseregounis 15 Jun. 1984 135 p
(Contracts DAAG29-83-K-0067; N00014-79-C-0858)
(AD-A145626; UCLA-ENG-84-14; UCLA-14) Avail: NTIS HC A07/MF A01 CSCL 09/5

This dissertation deals with the theory and design of antennas excited by a microstrip transmission line or by a gap generator. The antennas and the strip transmission line may be embedded inside or printed on the substrate. A theoretical approach is implemented which accounts accurately for the physical effects involved including surface waves. The Green's function has been obtained by synthesizing the fields of Hertzian dipoles which are oriented in arbitrary directions and which are printed on or embedded in the substrate. The method of solution is based on solving the Pocklington integral equations by employing the method of moments with proper choice of expansion and testing functions. The excitation mechanism is taken into account effectively by considering it as part of the antenna. Author (GRA)

N85-11279# Science Applications, Inc., McLean, Va.
COMMAND CONTROL GROUP BEHAVIORS. OBJECTIVE 1: A METHODOLOGY FOR AND IDENTIFICATION OF COMMAND CONTROL GROUP BEHAVIORS Final Report
Joel M. Reaser, Steven Stewart (Army Research Inst. for the Behavioral and Social Sciences, Fort Leavenworth, Kansas), and Roland V. Tiede Fort Leavenworth, Kansas Army Research Inst. for the Behavioral and Social Sciences Aug. 1984 186 p
(Contract MDA903-81-C-0254; DA Proj. 2Q1-62717-A-790)
(AD-A145690; ARI-RN-84-115) Avail: NTIS HC A09/MF A01 CSCL 17/2

This report provides the results of the first year's research of a three-year effort to identify the individual and multi-individual non-procedural skills exhibited by battalion command control group members and the commander/staff as a whole. In this project a model of command control group behavior was applied to identify and quantify four general categories of behavior. A methodology was developed for use at the Combined Arms Tactical Training Simulator (CATTS) at Ft. Leavenworth, Kansas. Extensive recordings were made of battalion commanders and their staffs as they underwent training at the facility fighting a highly realistic computer-assisted war game. The methodology was effective in distinguishing between groups in three of the four areas. Preliminary results show that both procedural and nonprocedural, individual, and team behaviors contribute to overall team performance. Author (GRA)

N85-11280# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.
TEST AND EVALUATION OF A COHERENT 35 GIGAHERTZ

RADAR REPEATER
J. S. Cole and L. W. Root Jan. 1984 65 p
(AD-A145714; AD-E950551; DRSMI/RE-84-1-TR) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report details the design, construction test, and evaluation of a 35 GHz radar repeater used to calibrate Independent Research and Development radars. Author (GRA)

N85-11281# California Univ., Livermore. Lawrence Livermore Lab.
MICROWAVE SUSCEPTIBILITY EXPERIMENTS
C. McConaghy 29 May 1984 20 p refs
(Contract W-7405-eng-48)
(DE84-016188; UCRL-53539) Avail: NTIS HC A02/MF A01

In certain experimental environments, systems can be affected or damaged by microwave pulses. Tests were conducted to understand the phenomenology of microwave susceptibility of system components and subsystem components. To date, experiments concentrated on bipolar transistors, similar to what might be used in discrete analog circuits, and on CMOS RAM chips, which might be used in a computer memory system. A decrease in failure energies for both the transistor and the integrated curcuit as I shortened the microwave pulse width was observed. An S band (2.86 GHz) transmit/receive (T/R) tube was tested both at S band and at X band (8.16 GHz). The S band pulse had limitations in rise-time from zero power, which had an effect on the amount of power that could be transmitted through the T/R tube; as much as 0.7% of the incident power passed through the tube. All tests were conducted in closed-waveguide or coax test-fixtures, in contrast to the anechoic chambers utilized by other experimenters. Both S band and X band Klystron generators were used. For very high power (greater than 1 MW), an additional pulse-compression cavity at S band was used. DOE

N85-11282# Tennessee Univ., Knoxville.
FINITELY CONDUCTING, INFINITELY LONG, CYLINDRICAL WIRE IN THE PRESENCE OF A PLANE WAVE (EMP)
H. P. Neff, Jr. and D. A. Reed 21 Feb. 1984 23 p refs
(Contract DE-AC05-84OR-21400)
(DE84-015363; DOE/OR-21400/T36) Avail: NTIS HC A02/MF A01

The time-domain current induced in an infinitely long, finitely conducting wire in the presence of a plane electromagnetic wave with its magnetic field perpendicular to the wire axis is determined by first finding the frequency-domain (phasor) solution. This is accomplished by using both a magnetic vector potential and an electric vector potential, and then treating the problem as a boundary-value problem. The time-domain current is found by performing the inverse Fourier transform numerically. Results indicate that the early time behavior is essentially that of a lossless wire, and the major effect is that the current dies out for large time such faster with loss than without loss. DOE

N85-11283# Rome Univ. (Italy). Ist. di Fisica.
ANALYSIS OF THE FRASCATI AND GENEVA GRAVITATIONAL WAVE ANTENNA BACKGROUND EXHIBITING THE ONE HALF SIDERAL DAY PERIOD
E. Amaldi, P. Bonifazi, G. Cavallari, S. Frasca, G. V. Pallottino, G. Pizzella, P. Rapagnani, and F. Ricci 18 Apr. 1983 33 p refs Prepared in cooperation with CNR, Frascati, Italy, Ist. Nazionale di Fisica Nucleare, Rome and CERN, Geneva
(Nota-Interna-801) Avail: NTIS HC A03/MF A01

Two gratitational antennas were operated successively for 2503 hr. Fourier analysis of the data gives a prominent peak at T = 718.03 + or - 0.05 min in agreement with the sideral semiperiod within an experimental error of + or - 3 sec. Arguments against interpretation in terms of gravitational radiation are reviewed. Author (ESA)

N85-11284# Rome Univ. (Italy). Ist. di Fisica.
SOME CONSIDERATIONS ON THE CAPACITIVE CALIBRATION USED FOR THE 2.3 TON CRYOGENIC ANTENNA AT CERN [ALCUNE CONSIDERAZIONI SUL SISTEMA DI CALIBRAZIONE CAPACITIVO, UTILIZZATO PER L'ANTENNA CRIOGENICA DI 2,3 TON AL CERN]
F. Ricci 1 Sep. 1983 21 p refs In ITALIAN
(Nota-Interna-809) Avail: NTIS HC A02/MF A01

The working principle of a capacitive calibrator is discussed and the mathematical model is compared with data available from a test done at liquid He temperature. The electric signal generated by the transducer motion, which is proportional to the displacement of the antenna tip is amplified at the normal vibration mode of the system by the electronic circuits of the gravitational antenna. The analysis shows the possibility of calibrating the antenna, obtaining the constant which relates the antenna displacements to transducer output. Author (ESA)

N85-11285# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
SENSITIVITY IMPROVEMENT OF A TWO-MODE GRAVITATIONAL RADIATION DETECTOR THROUGH THE USE OF A TRANSDUCER NOT PERFECTLY TUNED TO THE ANTENNA
M. G. Castellano (CNR, Frascati, Italy) and C. Cosmelli 14 Nov. 1983 19 p refs Presented at 2nd Workshop on Precision Meas. of Relativistic Effects in Astrophys. Systems, Rome, 11-13 Jul. 1983
(Nota-Interna-812) Avail: NTIS HC A02/MF A01

The behavior of a gravitational wave antenna coupled to a passive resonant transducer was analyzed for short bursts of gravitational radiation. An expression for the noise temperature of the system is given for a transducer with resonant frequency and mechanical quality factor different from those of the antenna. The analysis of the optimum noise temperature obtainable for a given system shows that, analyzing only one mode, the optimum performance is obtained when the frequency of the transducer is slightly different from that of the antenna. Author (ESA)

N85-11286# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
IMAGE THEORY FOR A VERTICAL ELECTRIC DIPOLE ABOVE A WIRE GRID WITH SQUARE CELLS
Ismo V. Lindell, Valeri P. Akimov, and Esko Alanen 1983 9 p refs
(Rept-S-150; ISBN-951-753-086-2; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

An exact image theory for the Sommerfeld problem is applied to the problem of a vertical electric dipole above a plane metallic grid with rectangular cells. The mesh size is assumed to be small compared to the wavelength and the wire diameter small compared to the mesh size, so that the Kontorovich averaged boundary condition concept is applicable. The image current consists of two exponential current waves located in complex space. The theory is seen to produce a simple expression for the TM surface wave excited by a vertical electric dipole. Author (ESA)

N85-11287# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
IMPEDANCE OF VERTICAL DIPOLES ABOVE A DISSIPATIVE GROUND
Esko Alanen and Ismo V. Lindell 1983 10 p refs
(Rept-S-152; ISBN-951-753-126-5; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

Self impedance formulas for a small horizontal wire loop and for a short vertical dipole above the ground are derived using the exact image principle. The resulting integrals behave extremely well for low antenna elevations and give good results with the simplest numerical approximations. Author (ESA)

N85-11288# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
[ACTIVITIES REPORT OF THE RADIO LABORATORY] Annual Report, 1982
Ismo V. Lindell, ed. 1983 26 p refs
(Rept-S-153; ISBN-951-753-127-3; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

Electromagnetic research; microwave applications to remote sensing, industry and medicine; radio science instrumentation;

millimeter wave propagation; radio astronomy; circuit theory; and computer aided design are discussed. Author (ESA)

N85-11289# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
GENERAL IMAGE THEORY FOR THE SOMMERFELD PROBLEM
Ismo V. Lindell and Esko Alanen 1984 17 p refs
(Rept-S-154; ISBN-951-753-206-7; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

Image theory for the general magnetic and/or electric dipole source above the dissipative ground (the Sommerfeld problem) with air and ground parameters discontinuous, is formulated in terms of horizontal electric and magnetic field components. The Fourier-transformed problem is seen to be analogous to a vector transmission line problem with dyadic distributed constants and dyadic reflection coefficient. Exact image expression is obtained for the general three-dimensional source. The reflection coefficient method is obtained as the far-field approximation of the general theory. Author (ESA)

N85-11290# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
EMP INJECTION ON CONDUIT ENTRIES, TYPE BRATTBERG
Oerjan Borgefalk and Torsten Dikvall May 1984 24 p In SWEDISH; ENGLISH summary Sponsored by Lyckeaaborgs Bruk AB
(FOA-E-30001-A3) Avail: NTIS HC A02/MF A01; Research Institute of National Defence, Stockholm KR 50

The ability of conduit entries to divert EMP currents from the cables to a shielding structure was studied. The gas tight entry has a brass plate connecting the cable sheath and cable shield with the shielding structure. The measurements were made at different values of the time derivative of the current. Results show that the diverting properties of the cable entries are satisfactory in most cases. Author (ESA)

N85-11291# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
DIGITAL RADIO LINK: COMPARISON OF THE RESISTANCE OF TWO DIFFERENT 4-PHASE MODULATION FORMS TO MULTIPATH PROPAGATION
Stefan Mattsson Aug. 1984 22 p refs In SWEDISH; ENGLISH SUMMARY
(FOA-C-30362-E; ISSN-0347-3708) Avail: NTIS HC A03/MF A01

Two 4-phase modulation forms were compared with respect to the resistance to frequency selective fading generated by simulated multipath propagation. As wave propagation model for digital microwave radio link exposed to tropospheric anomalies, a simplified three-way model was chosen. The validity of the model was confirmed by spectrum measurements on existing linkhops. The comparison between the different modulation forms focuses on different measures which characterizes the accessibility of the systems during periods of frequency selective fading.Author (ESA)

N85-11292# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
POSSIBILITIES AND LIMITS OF ELECTROMAGNETIC ACCELERATION IN SPACE APPLICATIONS Thesis [MOEGLICHKEITEN UND GRENZEN ELEKTROMAGNETISCHER BESCHLEUNIGER IN DER RAUMFAHRT]
Uwe Apel 29 May 1984 85 p refs In GERMAN
(ILR-Mitt-136) Avail: NTIS HC A05/MF A01

The state-of-the-art of electromagnetic mass driver concepts and railguns was investigated and space applications were determined. It is shown that technically, the application as stationary lunar appliance and as booster stage from Earth as well as nonstationary applications such as orbit transfer vehicle between near Earth orbits and geostationary orbits are viable. Poor performance compared with chemical propulsion is outlined. Disadvantages include large power supply, high system complexity, and low thrust. Author (ESA)

N85-11016*# Auburn Univ., Ala. Dept. of Electrical Engineering.
THE COMPUTER-COMMUNICATION LINK FOR THE INNOVATIVE USE OF SPACE STATION Abstract Only
Chester C. Carroll *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 52 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 17B

N85-11017*# Turner Broadcasting System, Atlanta, Ga.
THE REAL WORLD: THE USER
James Kitchell *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 53-59 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 17B

N85-11677# Joint Publications Research Service, Arlington, Va.
SCATTERING OF PLANE WAVE ON CYLINDRICAL SHELL IN LOW-FREQUENCY REGION Abstract Only
A. P. Paniklenko and S. A. Rybak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 3 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 2, Mar. - Apr. 1984 p 253-258 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11678# Joint Publications Research Service, Arlington, Va.
SLOWLY ROTATING PULSED RADIATION SOURCE Abstract Only
Yu. L. Levkovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 9 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 2, Mar. - Apr. 1984 p 238-242 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11696# Joint Publications Research Service, Arlington, Va.
EXCITATION OF QUASI-STATIC MAGNETIC FIELDS WITH AXIAL STRUCTURE Abstract Only
A. G. Karpenko, L. A. Lobachevskiy, and V. V. Migulin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 39 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 2, Sep. 1983 p 344-346 Previously announced as N84-30873 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11697# Joint Publications Research Service, Arlington, Va.
TRANSFORMATION OF HETEROGENEOUS SURFACE WAVES BY SKEWED STREAMS Abstract Only
A. P. Yevdokimov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 39-40 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR: Ser. A, Fiz.-Mat. i Tekhn. Nauki (Kiev), no. 3, Mar. 1984 p 48-52 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11698# Joint Publications Research Service, Arlington, Va.
THEORY OF RADIO WAVE PROPAGATION OVER THE OCEAN Abstract Only
A. G. Bugrov, V. I. Klyatskin, and B. M. Shevtsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 40 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 6, Apr. 1984 p 1372-1376 Original language doc. previously announced in IAA as A84-37095 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11778# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF ELECTROMAGNETIC WAVE BY SCREEN OF ARBITRARY SHAPE Abstract Only
K. S. Shifrin, Ya. S. Shifrin, and I. A. Mikulinskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 94 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 2, 26 Jan. 1984 p 68-72 (For primary document see

N85-11737 02-70)
Avail: NTIS HC A06/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-11293# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MICROSTRIP DIRECTIONAL FILTERS [FILTROS DIRECIONAIS EM MICROFITA]
Paulo Mello Marshall May 1984 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Simp. Brasileiro de Microondas, Brazil, 23-25 Jul. 1984
(INPE-3127-PRE/518) Avail: NTIS HC A02/MF A01

The results of an investigation of a microstrip directional filters are presented. Bandpass and bandstop travelling wave directional filters are designed to verify the design procedure. The performance obtained suggests the use of the travelling wave directional filter in microstrip multiplexers and in high rejection bandstop filters. Author

N85-11294*# Information and Control Systems, Inc., Hampton, Va.
SIMULATION STUDY OF A NEW INVERSE-PINCH HIGH COULOMB TRANSFER SWITCH Final Report
Sang H. Choi Oct. 1984 71 p refs
(Contract NAS1-17488)
(NASA-CR-172420; NAS 1.26:172420; FR-684103) Avail: NTIS HC A04/MF A01 CSCL 09A

A simulation study of a simplified model of a high coulomb transfer switch is performed. The switch operates in an inverse pinch geometry formed by an all metal chamber, which greatly reduces hot spot formations on the electrode surfaces. Advantages of the switch over the conventional switches are longer useful life, higher current capability and lower inductance, which improves the characteristics required for a high repetition rate switch. The simulation determines the design parameters by analytical computations and comparison with the experimentally measured risetime, current handling capability, electrode damage, and hold-off voltages. The parameters of initial switch design can be determined for the anticipated switch performance. Results are in agreement with the experiment results. Although the model is simplified, the switch characteristics such as risetime, current handling capability, electrode damages, and hold-off voltages are accurately determined. M.A.C.

N85-11295# Royal Signals and Radar Establishment, Malvern (England).
MULTIPLE PASSBAND TRANSDUCERS FOR TONE SELECTION FROM A FREQUENCY COMB GENERATOR
C. L. West May 1984 28 p refs
(RSRE-MEMO-3647; BR92489) Avail: NTIS HC A03/MF A01

Design procedures used to realize switchable multiple passband surface acoustic wave transducers are described. The transducers can be used in series to act as selectors of tones from a comb generator. Experimental results of devices which can select between 16 tones separated by 1 MHz at a center frequency of 100 MHz are given. Author (ESA)

N85-11296# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
ROUTING THE POWER AND GROUND WIRES ON A VLSI CHIP M.S. Thesis
A. S. Moulton Jul. 1984 70 p
(Contracts N00014-80-C-0622; F49620-81-C-0054)
(AD-A145356; MIT/LCS/TR-322) Avail: NTIS HC A04/MF A01 CSCL 09/3

This thesis presents four new algorithms to route noncrossing power and ground trees in one metal layer of a VLSI chip. The implementation of the best algorithm forms MIT's Placement-Interconnect (PI) Projects power-ground routing phase. The input of this power-ground algorithm is a set of rectangular modules on a rectangular chip. Because of bonding limitations, the pads are placed along the chip's perimeter, while the logic modules are placed in the interior. In constructing the power-ground layout, the algorithm first lays a ground ring between the pads and the chip's perimeter, then a power ring between the logic modules and the pads. Next, a tree of wires connects the ground pad with the logic modules' ground connection points. Then, starting at various points on the power ring, several branches of wires connect the power ring to the logic modules' power connection points. A tree-traversal algorithm then uses the modules' current requirements to determine how much current will flow through each power-ground wire during the chip's operation. An algorithm then widens each wire to the width appropriate for carrying that current. Author (GRA)

N85-11297# General Motors Corp., Goleta, Calif. Delco Electronics Div.
15 kW GENERAL PURPOSE FREQUENCY CHANGER PERFORMANCE IMPROVEMENT
12 Mar. 1984 149 p
(Contract DAAK70-77-C-0157)
(AD-A145503; R81-31) Avail: NTIS HC A07/MF A01 CSCL 10/2

The 15 kW Frequency Changer performance improvement involved operation with a 220/380-volt ac source as well as demonstration of parallel operation and transient-free, on-bus/off-bus transfer with an alternate power source. This effort required design and construction of additional hardware to augment the Army/Delco Electronics developed 15 kW Frequency Changer, which is designed to operate from a 120/208-volt ac, three-phase power source. This report is organized into two major parts. The first deals with the operation of the 15 kW Frequency Changer with a 220/380-volt ac source, and the second deals with parallel operation and transient-free transfer. For demonstration purposes, 220/380-volt ac operation utilized the utility 60-hertz power source. The system was also configured to operate with the 50-hertz European power source. Conceptually the system was also suitable for use with a 400-hertz power source, but the input magnetics were designed for 50/60-hertz operation only. For demonstration purposes, parallel operation and transient-free transfer was accomplished with either the 60-hertz utility power or a turbine-engine generator set. Author (GRA)

N85-11298# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM/T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Apr. - 30 Jun. 1984
F. M. Bruno 30 Jul. 1984 13 p
(Contract DAAK70-80-C-0168)
(AD-A145597; TEI-A009-15; QR-15) Avail: NTIS HC A02/MF A01 CSCL 09/1

The object of this study is to develop design, performance, and test specifications for the Miniature Cathode Ray Tube assembly suitable for use in the Integrated Helmet and Display Sight System (IHADSS) of the Army Advanced Attack Helicopter. GRA

N85-11299# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A HIGH-VOLTAGE DISCHARGER
V. N. Bondaletov and R. I. Golitsyn 17 Aug. 1984 7 p Transl. into ENGLISH from Russian Patent No. 347849, (22 Sep. 1972) p 1-3
(AD-A145659; FTD-ID(RS)T-0341-84) Copyright. Avail: NTIS HC A02/MF A01 CSCL 09/5

An invention used to decrease the inductive and active

reactances for the discharging of powerful, low induction capacitor banks is described. A circuit diagram of the discharger is included. M.A.C.

N85-11300# Human Engineering Labs., Aberdeen Proving Ground, Md.
HUMAN ENGINEERING LABORATORY GROUNDING ANALYSIS: PROJECT HELGA Final Report
B. Keiser Jun. 1984 35 p
(AD-A145728; HEL-TN-9-84) Avail: NTIS HC A03/MF A01 CSCL 09/3

Techniques for grounding mobile (relocatable) tactical army systems are described. Alternative methods for grounding tactical military structures are discussed and a diamond mesh grounding screen is recommended for investigation. GRA

N85-11301# Department of the Army, Washington, D. C.
METHOD OF MAKING A POROUS CARBON CATHODE: A POROUS CARBON CATHODE SO MADE, AND ELECTROCHEMICAL CELL INCLUDING THE POROUS CARBON CATHODE Patent Application
M. Binder, E. R. Petersen, C. W. Walker, Jr., W. L. Wade, Jr., and S. Gilman, inventors (to Army) Filed 13 Aug. 1984 8 p
(AD-D011243; US-Patent-Appl-SN-640265) Avail: NTIS HC A02/MF A01 CSCL 09/1

A porous carbon cathode for use in an electrochemical cell is made by wetting the carbon black with a 1:1 to 1:3 mixture of isopropyl alcohol:water, adding a binding agent thereto, smearing the resulting stiff paste on a thin expanded metal screen and pressing and rolling to the desired thickness, drying the cathode sheet in a vacuum oven at about 100 C for one hour while a weight is placed above and below the cathode sheet which is sandwiched between two pieces of blotting paper, the total weight applied being sufficient for the cathode to retain structural integrity, removing the weight and blotting papers and inserting the cathode sheet in an elevated drying oven at about 280 C for about one hour, and cooling the cathode sheet between blotting paper, repressing and rolling. Cathodes prepared by this method appear structurally strong, maintain their physical integrity with a minimum of cracking and flaking, and do not crumble when cut. The porous carbon cathode is particularly advantageous when included in a lithium sulfuryl chloride cell, but can be used in any requiring porous carbon cathodes. Author (GRA)

N85-11302# Mound Lab., Miamisburg, Ohio.
METALLOGRAPHY OF KOVAR/GLASS/THERMITE INTERFACES
M. D. Kelly, J. J. Cramer, and L. D. Abney Jul. 1984 7 p refs Presented at 17th Ann. Convention of the Intern. Metallographic Soc., Philadelphia, 15 Jul. 1984
(Contract DE-AC04-76DP-00053)
(DE84-015247; MLM-3169(OP); CONF-840766-3) Avail: NTIS HC A02/MF A01

Kovar pins are used to form electrical feedthroughs in thermite composites. The pins are electrically insulated from the thermite by a glass coating that bonds the pins to the thermite during processing. Metallography of the glass Kovar interface and the glass thermite interface shows good interfacial contact free of voids and cracks. DOE

N85-11303# Syracuse Univ., N. Y.
SURFACE SEGREGATION OF SULFUR DURING OSCILLATORY PIN-ON-PLATE WEAR STUDIES OF PRECIOUS METAL ELECTRICAL CONTACT ALLOYS.1: FRICTION AND ELECTRICAL CONTACT RESISTANCE
R. W. Vook, L. E. Pope (Sandia National Labs., Albuquerque, New Mex.), and R. W. Rohde (Sandia National Labs., Albuquerque, New Mex.) 1984 10 p refs Presented at 12th Intern. Conf. on Elec. Contact Phenomena, Chicago, 17 Sep. 1984
(Contract DE-AC04-76DP-00789)
(DE84-006962; SAND-83-2151C; CONF-840935-1-Pt-1) Avail: NTIS HC A02/MF A01

An oscillatory pin-on-plate experimental configuration was used to investigate friction and electrical contact resistance phenomena of a gold base (ASTM B541) and a palladium base (ASTM B540) alloy couple. Effects which could be attributed to surface segregation were noted. Measurements were made in controlled environments of dry helium, dry carbon dioxide and dry air at atmospheric pressure. A load cell was used to measure the friction force continuously. No lubrication was employed. A U-shaped pin was used with electrical connections to measure electrical contact resistance for both forward and reverse direct currents. Friction coefficients were initially high but decreased to a steady value of approximately 0.2 as the number of oscillatory cycles increased for dry carbon dioxide and dry air. The friction results for dry helium were much more erratic. Friction coefficients are much less sensitive to the nature of the contact interface than is electrical contact resistance. The electrical contact resistance always had initial values of 1 to 10 millions, but it tended to increase by up to three orders of magnitude in a nonreproduceable manner for all three gases. DOE

N85-11304# Oak Ridge National Lab., Tenn. Atomic, Molecular and High Voltage Physics Group.
RECENT ADVANCES IN GASEOUS DIELECTRICS
L. G. Christophorou, I. Sauers, D. R. James, H. Rodrigo, M. O. Pace, J. G. Carter, and S. R. Hunter 1984 15 p refs Presented at IEEE Intern. Symp. on Elec. Insulation, Montreal, 11 Jun. 1984
(Contracts DE-AC05-840R-21400; W-7405-eng-26)
(DE84-014279; CONF-8406174-1) Avail: NTIS HC A02/MF A01

Recent developments in gaseous dielectrics are discussed with emphasis on dielectric gas mixtues containing SF6. Recent findings on the isotopic, pressure, and nonuniform field dependence of the dielectric strength of gases are also presented, and ways to enhance the corona-stabilization characteristics of gas mixtures by appropriate additives (e.g., to SF6) are outlined. In addition, results are presented on the spark decomposition products of SF6 and the alleviation of the harmful effects of conducting particles by particle coating in situ. Finally, electron attachment, electrode drift velocity, and breakdown properties of gas mixtures (e.g., C2F6 or C3F8 in Ar or CH4) - comprised of electron attaching and electron conductivity enhancing components - which have promise for use in pulsed power technologies are reported. DOE

N85-11305# South Dakota State Univ., Brookings.
SUMMARY OF ACTIVITIES PERTAINING TO UTILIZATION OF GRANT PURCHASE OF BATTERIES FOR ELECTRIC VAN Final Report
W. E. Knabach 3 Dec. 1983 2 p
(Contract DE-FG48-81R8-06037)
(DE84-015793; DOE/R8-06037/T1; SD-81-003) Avail: NTIS HC A02/MF A01

Experience with industrial batteries for the Battronic Electric Van are described. The operation of the van and battery charging problems are discussed. DOE

N85-11306# Los Alamos Scientific Lab., N. Mex.
RESISTANCE AND INDUCTANCE CALCULATIONS FOR HELICAL FLUX COMPRESSION GENERATORS
N. M. Schnurr May 1984 30 p refs
(Contract W-7405-eng-36)
(DE84-015068; LA-10056-MS) Avail: NTIS HC A03/MF A01

Methods were developed to calculate the resistance and inductance of explosively driven helical flux compression generators. The coil radius, armature radius, and wire diameter of the generator must be constant, but the number of parallel paths in the coil is arbitrary and bifurcation of conductors is allowed. The inductance is calculated as a function of time in the stand alone computer code HFCGL. The results may be used as input to the Los Alamos railgun estimator (LARGE) code. Resistance calculations are performed in the subroutine HFCGR developed for use in the LARGE code. DOE

N85-11307# Institute of Gas Technology, Chicago, Ill.
EFFECTS OF H2S ON MOLTEN CARBONATE FUEL CELLS Progress Report, 1 Jan. 1984 - 31 Mar. 1984

R. J. Remick Jul. 1984 43 p refs
(Contract DE-AC21-83MC-20212)
(DE84-015166; DOE/MC-20212/1629) Avail: NTIS HC A03/MF A01

The identification of the poisoning mechanism(s) responsible for performance losses of molten carbonate fuel cells (MCFC) when operating on sulfur containing gases was analyzed. The focusing was on out of cell and in cell experiments on single mechanistic issues, followed by incorporation of the results into a model that correlates cell potential decline to contaminants(s) concentration. When coupled with gas cleanup cost projections, the model can be used to conduct trade off studies which lead to the selection of optimum feed gas compositions for MCFC power plants. The degree to which H2S and other contaminants must be removed from typical MCFC fuels has a profound effect on the cost of cleaning the fuel gas, especially if contaminant levels lower than 0.1 ppM are required. The anticipated product from the overall program is a justifiable specification for gas cleanup requirements for MCFC power plants. DOE

N85-11684# Joint Publications Research Service, Arlington, Va.
LUMINOUS POINTS AND BREAKDOWN IN STRUCTURE OF GaAs TRANSISTORS Abstract Only
S. G. Gasan-Zade, Ye. A. Salkov, and G. A. Shepelskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 20 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 17, no. 11, Nov. 1983 p 1931-1934 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-11308 Connecticut Univ., Storrs.
THREE DIMENSIONAL SEPARATION AND VORTEX FORMATION Ph.D. Thesis
Michael Thomas Boyle 1984 358 p
Avail: Univ. Microfilms Order No. DA8416084

The horseshoe vortex flow phenomena has been observed by fluid dynamics researchers for many years. For the case of symmetrical flows, such as the flow past a single cylinder, the flow can be calculated in the region upstream of the vortex; however, for asymmetrical flow even this had not yet been accomplished. The vortex flow is described for the asymmetrical case of flow past two cylinders mounted side by side in a wind tunnel. A new limiting streamline flow visualization technique has been used on the endwall and two-cylinder surfaces. The pressure distribution on the endwall and cylinder surface has been measured and the vortex flow field described by use of a five-hole probe. The five-hole probe measurements show a single primary vortex with a wide flat cross-section. The endwall flow visualization reveals a single separation line consistent with the single primary vortex and an attachment line running between the primary vortex and a smaller counter-rotating vortex located near the cylinder-endwall junction. The high shear on the endwall beneath this vortex flow is displayed very clearly in these measurements.
Dissert. Abstr.

N85-11309 Rhode Island Univ., Kingston.
AN INTEGRAL METHOD FOR ANALYZING INCOMPRESSIBLE TWO DIMENSIONAL TURBULENT BOUNDARY LAYERS WITH SEPARATION Ph.D. Thesis
Debendra Kumar Das 1983 277 p
Avail: Univ. Microfilms Order No. DA8416184

An integral method is proposed for analyzing incompressible two dimensional turbulent boundary layers with flow separation based on the inner variable theory. Utilizing the law-of-the-wall and wake, the integration of continuity and momentum equations across the boundary layer gives a differential equation in terms of the wake parameter and the shear velocity. With the aid of an empirical correlation between the wake parameter and the pressure gradient parameter, derived from the experimental data of several separated and near separating flows, the above equation is reduced to a single ordinary differential equation in skin friction. Predictions have been made for a wide range of flows and satisfactory agreement is observed between the theory and the experimental measurements. The method is practically insensitive to the separation point singularity and calculation proceeds smoothly through the separation point into the reverse flow region without any numerical instability. Various degrees of refinement are possible for this theory and they are summarized in the text. Dissert. Abstr.

N85-11310 Clemson Univ., S.C.
CHARACTERISTICS OF A TURBULENT PLANE OFFSET JET Ph.D. Thesis
James Ray Rick Pelfrey 1984 132 p
Avail: Univ. Microfilms Order No. DA8416683

A plane, incompressible, turbulent air jet is discharged into quiescent ambient surroundings above a plate offset from, and parallel to, the axis of the jet discharge. Entrainment of the fluid below the jet and above the plate causes a reduced pressure in this region forcing the jet to deflect towards the boundary and eventually attach to it. Velocity data for the primary jet flow and the recirculation region were obtained and the attachment length was determined. Mean veocity data within the recirculation region is used to determine a dividing streamline which, on average, separates the primary jet flow from the recirculation region. The primary jet flow entrainment was found to have wide variations in the region prior to the jet attachment, and is seen to be related to the distribution of pressure in the recirculation region. Results show the local jet entrainment parameter to be significantly different from that of either a free jet or wall jet. The effective drag of the recirculation region on the primary jet flow was determined as well as distributions of higher order moments, energy spectra, autocorrelation functions, and integral scales. Turbulence energy spectra show that the relative energy content shifts from higher to lower frequencies and the rate of energy decay in the low frequency range increases as the jet approaches impingement.
Dissert. Abstr.

N85-11311 Virginia Polytechnic Inst. and State Univ., Blacksburg.
STABILITY OF HEATED BOUNDARY LAYERS Ph.D. Thesis
Waqar Asrar 1983 103 p
Avail: Univ. Microfilms Order No. DA8415927

A three-dimensional linear stability analysis is presented for two-dimensional boundary layer flows. The method of multiple scales is used to derive the amplitude and the wave number modulation equations, which take into account the nonparallelism of the basic flow. The zeroth-order eigenvalue problem is numerically integrated to calculate the quasi-parallel growth rates which are then integrated together with the nonparallel growth rates along the characteristics of the wave number modulation equations to evaluate the n-factors. The most critical frequency is defined to be the one that yields the n-factor corresponding to transition in the shortest possible distance. This definition is used to evaluate the critical frequency for the Blasius boundary layer, a wedge flow, and an axisymmetric boundary layer. The effect of three-dimensional disturbances is evaluated and found to be less critical than two-dimensional disturbances. The effect of heating the boundary layer is evaluated for the Blasius, Falkner-Skan, and axisymmetric boundary layers. Dissert. Abstr.

N85-11312 British Library Lending Div., Boston Spa (England).
SOME OF THE FEATURES OF MOVEMENT OF GAS THROUGH A LAYER OF FREE-FLOWING SUBSTANCES
P. G. Rusakov, I. F. Rusanov, and V. N. Dorofeev 18 Jul. 1984 8 p Transl. into ENGLISH from Izv. (USSR) p 27-30
(BLL-M-35732-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The equipment and materials used to find details of transverse movement by gases which move upwards through free flowing materials are described. An equation is given for working out flow rates. It is found that there is very little horizontal movement by the gases in a blast furnace. E.A.K.

N85-11313 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF CRISIS PHENOMENA IN THERMOSYPHONS WITH INTERNAL HEAT-DISSIPATION
N. Yu. Koloskova, V. Ya. Vyazovik, and V. V. Berecov 18 Jul. 1984 4 p Transl. into ENGLISH from Izv. (USSR), no. 11, 1983 p 173
(BLL-M-35765-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The addition of an internal condenser provides a means of halving the geometric dimensions of the heat-dissipating zone of thermosiphons. The determination of horizontally disposed thermosiphons with internal heat dissipation was investigated. B.G.

N85-11314*# Continuum, Inc., Huntsville, Ala.
SIMULATION OF SOLIDIFICATION IN A BRIDGMAN CELL Interim Report
Youssef M. Dakhoul and Richard C. Farmer Washington NASA Nov. 1984 24 p refs
(Contract NAS8-35331)
(NASA-CR-3843; NAS 1.26:3843) Avail: NTIS HC A02/MF A01 CSCL 20D

The Hg/Cd/Te solidification in a Bridgman cell was thermally analyzed by Continuum's VAST code. The energy equation is solved in an axisymmetric, quasi steady domain for both the molten and solid alloy regions. Alloys composition is calculated by a simplified one dimensional model to estimate its effect on melt thermal conductivity and, consequently, on the temperature field within the cell. Solidification is assumed to occur at a fixed temperature of 979 K. Simplified boundary conditions are included to model both the radiant and conductive heat exchange between the furnace walls and the alloy. Calculations are performed to show how the steady state isotherms are affected by: (1) the hot and cold furnace temperatures; (2) boundary condition parameters; and (3) the growth rate which affects the calculated alloy's composition. E.A.K.

N85-11315*# CHAM of North America, Inc., Huntsville, Ala.
NUMERICAL ANALYSIS OF FLOW AND HEAT TRANSFER IN THE VAFB LOX STORAGE DEWAR TANK Final Report
L. T. Tam and A. K. Singhal Oct. 1984 90 p refs
(Contract NAS8-35666)
(NASA-CR-174028; NAS 1.26:174028; CHAM/4040-6) Avail: NTIS HC A05/MF A01 CSCL 20D

The present report describes numerical simulation of three-dimensional transient distributions of velocity and temperature of liquid oxygen (LOX) in the LOX Dewar tank of Vendenberg Air Force Base (VAFB). The present analyses cover the replenish time period only. Four test cases have been considered. For all four cases, the input boundary conditions are comprised of LOX facility heat loads, drain flow rates, recirculation flow rates and dewar heating. All the quantities are prescribed as functions of time. The first two test cases considered sensitivity of results to the computational grid. In Case 3, system heat load was changed, while in Case 4, a lower LOX level was specified. Cases 1 and 2 showed that the temperatures were not sensitive to the grid refinement. This provided a basic check on the numerical model. Cases 3 and 4 showed that the thermal boundary layer motion near the tank surface becomes more significant at the late time, e.g., 5 1/2 hours from replenish start. Comparison between results of Cases 3 and 4 showed, as expected, that the smaller initial LOX volume given in Case 4, results in higher temperature level. All calculated velocity and temperature distributions were found to be plausible. B.W.

N85-11316*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIRECT NUMERICAL SIMULATION OF CURVED TURBULENT CHANNEL FLOW
R. D. Moser and P. Moin Oct. 1984 171 p refs
(NASA-TM-85974; NAS 1.15:85974; Rept-85024) Avail: NTIS HC A08/MF A01 CSCL 20D

Low Reynolds number, mildly curved, turbulent channel flow has been simulated numerically without subgrid scale models. A new spectral numerical method developed for this problem was used, and the computations were performed with 2 million degrees of freedom. A variety of statistical and structural information has been extracted from the computed flow fields. These include mean velocity, turbulence stresses, velocity skewness, and flatness factors, space time correlations and spectra, all the terms in the Reynolds stress balance equations, and contour and vector plots of instantaneous velocity fields. The effects of curvature on this flow were determined by comparing the concave and convex sides of the channel. The observed effects are consistent with experimental observations for mild curvature. The most significant difference in the turbulence statistics between the concave and convex sides was in the Reynolds shear stress. This was accompanied by significant differences in the terms of the Reynolds shear stress balance equations. In addition, it was found that stationary Taylor-Gortler vortices were present and that they had a significant effect on the flow by contributing to the mean Reynolds shear stress, and by affecting the underlying turbulence. B.W.

N85-11317*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY RESULTS OF A STUDY OF THE RELATIONSHIP BETWEEN FREE STREAM TURBULENCE AND STAGNATION REGION HEAT TRANSFER
James VanFossen, Jr. and Robert J. Simoneau [1984] 16 p refs Proposed for presentation at the 30th Intern. Gas Turbine Conf. and Exhibit, Houston, Tex., 17-21 Mar. 1985; sponsored by the American Society of Mechanical Engineers
(NASA-TM-86884; E-2346; NAS 1.15:86884) Avail: NTIS HC A02/MF A01 CSCL 20D

The mechanism that causes free stream turbulence to increase heat transfer in the stagnation region of turbine vanes and blades was studied. The work is being conducted in a wind tunnel at atmospheric conditions to facilitate measurements of turbulence and heat transfer. The model size is scaled up to simulate Reynolds numbers (based on leading edge diameter) that are to be expected on a turbine blade leading edge. Reynolds numbers from 13,000 to 177,000 were run in the present tests. Spanwise averaged heat transfer measurement with high and low turbulence were made with rough and smooth surface stagnation regions. Results of these measurements show that the boundary layer remains laminar in character even in the presence of free stream turbulence at the Reynolds numbers tested. If roughness is added the boundary layer becomes transitional as evidenced by the heat transfer increase with increasing distance from the stagnation line. Hot wire measurements near the stagnation region downstream of an array of parallel wires has shown that vorticity in the form of mean velocity gradients is amplified as flow approaches the stagnation region. Author

N85-11318*# Computational Mechanics Consultants, Knoxville, Tenn.
THE CMC/3DPNS COMPUTER PROGRAM FOR PREDICTION OF THREE-DIMENSIONAL, SUBSONIC, TURBULENT AERODYNAMIC JUNCTURE REGION FLOW. VOLUME 3: PROGRAMMERS' MANUAL
J. A. Orzechowski Sep. 1982 131 p
(Contract NAS1-15105)
(NASA-CR-165998; NAS 1.26:165998; COMCO-82TR-2.2-Vol-3) Avail: NTIS HC A07/MF A01 CSCL 20D

The CMC fluid mechanics program system was developed to transmit the theoretical evolution of finite element numerical solution methodology, applied to nonlinear field problems into a versatile computer code for comprehensive flow field analysis. A detailed view of the code from the standpoint of a computer programmer's use is presented. A system macroflow chart and detailed flow charts of several routines necessary to interact with

a theoretican/user to modify the operation of this program are presented. All subroutines and details of usage, primarily for input and output routines are described. Integer and real scalars and a cross reference list denoting subroutine usage for these scalars are outlined. Entry points in dynamic storage vector IZ; the lengths of each vector accompanying the scalar definitions are described. A listing of the routines peculiar to the standard test case and a listing of the input deck and printout for this case are included. E.A.K.

N85-11319# Scientific Research Associates, Inc., Glastonbury, Conn.
FURTHER DEVELOPMENT OF A TRANSONIC CASCADE ANALYSIS Final Report, 10 Aug. 1982 - 10 Aug. 1983
S. J. Shamroth, R. J. Yang, and H. McDonald Sep. 1983 49 p (Contract N00019-82-C-0298)
(AD-A145410; SRA-R83-920015-F) Avail: NTIS HC A03/MF A01 CSCL 20/4

A compressible, time-dependent solution of the Navier-Stokes equations is obtained for both compressor and turbine cascade configurations in subsonic and transonic flows. The analysis uses the Briley-McDonald consistently split linearized block implicit (LBI) procedure to solve the governing equations. Comparisons with measured data are presented for both turbulence energy and mixing length turbulence models. In addition, consideration is given to boundary conditions for the cascade flutter problem. Author (GRA)

N85-11320# Georgia Inst. of Tech., Atlanta. School of Chemical Engineering.
EFFECT OF THE BASSET TERM ON PARTICLE RELAXATION BEHIND NORMAL SHOCK WAVES Final Report, 15 Mar. 1983 - 15 May 1984
L. J. Forney, A. E. Walker, and W. K. McGregor Jul. 1984 72 p (Grant AF-AFOSR-0182-83)
(AD-A145446; AFOSR-84-0747TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

Small particles and droplets encounter normal shocks in a variety of applications. The particle-shock interaction subjects the particles to large unsteady drag forces behind the shock front. In this paper, an analysis has been made of the relative importance of the Basset history integral for particle displacement and velocity behind a normal shock wave. The effect of the Basset integral has been related to gas stagnation conditions and the local gas Mach number. In the present theoretical study it has been demonstrated that the particle velocity and displacement relative to the gas back of the shock is unaffected by the inclusion of the Basset term until the latter stages of particle relaxation. The effect of the Basset history integral, which results from diffusion of vorticity from the decelerating particle, has been shown to decrease the particle drag or increase the displacement of the particle back of the shock. The effect is magnified with increasing stagnation pressures and particle diameters but with decreasing gas stagnation temperatures. GRA

N85-11321# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
APPROXIMATE SOLUTION OF A LAMINAR FLOW OVER A FLAT PLATE WITH SUCTION AND PRESSURE GRADIENT M.S. Thesis
G. F. DAmore 1984 99 p
(AD-A145482; AFIT/CI/NR-84-66T) Avail: NTIS HC A05/MF A01 CSCL 20/4

This thesis derives and analyzes an approximate velocity solution that represents a suction flow over a flat plate. The solution is derived from the momentum integral equation in terms of the suction and pressure gradient parameters. These parameters are adjusted so that unit flow separation is achieved. Further analysis is done with displacement thickness, momentum thickness, and friction. Other proven solutions are compared with this analysis. The approximate solution is in good agreement with the Blasius solution for zero suction and zero pressure gradient. Increasing suction velocity prevents or delays flow separation and permits a flow to withstand higher adverse pressure gradient. The solution is limited to a suction parameter equal to -2 and consequently an optimum suction velocity is found. Suction velocity decreases the boundary layer thickness, and adverse pressure gradient increases the boundary layer thickness. GRA

N85-11322# Naval Research Lab., Washington, D. C.
RAYLEIGH-TAYLOR INSTABILITY IN COMPRESSIBLE MEDIA
D. L. Book 3 Aug. 1984 50 p
(AD-A145491; AD-E000594; NRL-MR-5373) Avail: NTIS HC A03/MF A01 CSCL 20/4

The theoretical work previously done on Rayleigh Taylor instability in compressible fluids has been reviewed in a chapter written for the Encyclopedia of Fluid Mechanics, to be published by Gulf. The physical basis of the instability, the dependence of growth rate on a adiabatic index gamma, and the stability of uniform self similar implosions and expansions are discussed. GRA

N85-11323# Naval Ship Research and Development Center, Bethesda, Md.
DESIGN, MANUFACTURE, AND TESTING OF COMPLIANT COATINGS FOR REDUCTION OF TURBULENT DRAG
S. C. Dickinson, J. L. Power, and J. J. Eynck Aug. 1984 48 p
(AD-A145510; DTNSRDC-84/060) Avail: NTIS HC A03/MF A01 CSCL 11/3

The drag of three compliant coatings was measured in the DTNSRDC 36-inch water tunnel. Two coatings were of the Kramer type, while the other one was a closed-cell neoprene foam. The drag of the 2.032-m (80-in.) long and 0.737-m (29-in.) wide compliant coatings was compared to the drag of a smooth, solid reference plate. GRA

N85-11324# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
NEW APPROACHES TO HYDRODYNAMIC FLOW VISUALIZATION ON SURFACES Final Report
P. K. Besch and M. S. Alvarado Jul. 1984 45 p
(DA Proj. SR0-2301)
(AD-A145528; DTNSRDC/SPD-1107-01) Avail: NTIS HC A03/MF A01 CSCL 20/4

A wide range of technologies was surveyed to find promising new techniques of visualizing hydrodynamic flow phenomena on surfaces. Various forms of coatings were considered: liquids, erodable solids, small tufts, chemicals, liquid crystals, and optically deformable coatings. Experimental and conceptual studies indicate that high-viscosity fluids for dot patterns, optical techniques with soft coatings, and liquid crystals in modified form, may provide improved flow visualization. However, each of these techniques requires further development as specified in the report. Author (GRA)

N85-11325# Naval Research Lab., Washington, D. C.
MEASUREMENT OF AREAL MASS VARIATION IN RAYLEIGH-TAYLOR UNSTABLE TARGETS
J. Grun, M. H. Emery, M. J. Herbst, S. Kacenjar, and C. Opal 14 Jun. 1984 31 p
(DNA Proj. I25-BMXI)
(AD-A145541; AD-E000593; NRL-MR-5322) Avail: NTIS HC A03/MF A01 CSCL 20/4

We present the first measurements of Rayleigh-Taylor caused mass redistribution resolved in two spatial dimensions. Bubble and spike formation and two dimensional effects have been observed. Results are consistent with theory which claims that the Rayleigh Taylor growth rate is about 1/2 of classical. GRA

N85-11326# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL STUDY OF JET IMPINGEMENT ON A CIRCULAR CYLINDER M.S. Thesis
D. W. Potts Aug. 1984 196 p
(AD-A145583; AFIT/CI/NR-84-50T) Avail: NTIS HC A09/MF A01 CSCL 20/4

A round turbulent jet was impinged normally upon a circular cylinder and the resulting flow field was studied. The investigation was conducted using a jet which issued from a nozzle with an 11/16 inch diameter. The cylinder had a diameter of 6 5/8 inches.

The jet impinged upon the cylinder at nozzle distances of 7, 15, and 30 nozzle diameters, and at velocities of 400 and 500 ft/s. The free jet was studied and found to be typical by comparing it to earlier studies done with round turbulent jets. Surface flow visualization tests were performed to determine the direction of the flow. The wall jet about the cylinder, resulting from the impinging jet, was studied. Measurements of the velocity profiles and turbulence intensities were made. These results were compared to the same information obtained for flat plates and found to be similar for the nozzle distance of 7 diameters. At nozzle distances of 15 and 30 diameters the data was no longer similar. From velocity measurements, the spread rates and decay rates of the wall jet were determined. These results were compared to similar studies done for flat plates. Decay rates were found to be less than that of flat plates and spread rates were greater than that of flat plates, especially about the circumference of the cylinder.
GRA

N85-11327# Ballistic Research Labs., Aberdeen Proving Ground, Md.
MOMENT INDUCED BY LIQUID PAYLOAD DURING SPIN-UP WITHOUT A CRITICAL LAYER Final Report
C. H. Murphy Aug. 1984 55 p
(DA Proj. 1L1-61102-AH-43)
(AD-A145716; AD-F300461; ARBRL-TR-02581; IMR-774) Avail: NTIS HC A04/MF A01 CSCL 19/1

For a fully spun-up liquid payload, eigenfrequencies and liquid side moments induced by projectile coning motion have been computed by a linear boundary layer theory. For partially spun-up liquids, this theory can fail due to the presence of a critical layer in which the local angular velocity of the spinning motion is near the angular velocity of the projectile's coning motion. Late in the spin-up process, when more than 90% of the spin angular momentum has been acquired by the liquid, a critical layer usually does not exist. In this report, a linear-boundary-layer theory is developed to predict eigenfrequencies and the liquid moment during late spin-up times. The predicted eigenfrequencies agree well with those computed by the linearized Navier-Stokes technique of Gerber and Sedney. The side moments predicted by the linear-boundary-layer theory are available to projectiie designers for flight stability analysis.
GRA

N85-11328# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
AN INVESTIGATION INTO THE ADVANTAGES OF FLUIDICS IN FLUID PROCESSING. PART 1: AN OVERVIEW OF FLUIDICS
V. Jankevics, R. Boucher, R. Woods, and K. S. Nystroem Apr. 1984 51 p refs
(Contract STU-79-6662)
(FFA-TN-1984-15-Pt-1) Avail: NTIS HC A04/MF A01

Fluidics components and applications examples from fluidics and signal fluidics, including vortex control, flow diversion, temperature sensors, and pressure sensors are described. Passive flow control applications in industry and energy technology are suggested.
Author (ESA)

N85-11329# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
THE BEHAVIOUR OF UNSTABLE SURFACES: A LITERATURE REVIEW
S. M. Farwagi Jun. 1984 45 p refs
(CFD-84/6) Avail: NTIS HC A03/MF A01

Literature concerning the Rayleigh-Taylor instability of the interface between two immiscible fluids of different densities is reviewed. Analytical expressions describing the growth of the instability are presented. Numerical models used to study the instability are described and their predictions are compared with experimental and analytical results. Experimental observations are also described.
Author (ESA)

N85-11330# Imperial Coll. of Science and Technology, London (England) Computational Fluid Dynamics Unit.
NUMERICAL SIMULATION OF NATURAL CONVECTION IN POROUS MEDIA
D. Brian Spalding Jul. 1984 46 p refs
(CFD-84/10) Avail: NTIS HC A03/MF A01

Numerical predictions of the influence of an intervening flow-resistive medium on the natural convection heat transfer between two long concentric horizontal cylinders are presented. The full range of resistivity is covered, from low values in which inertia and viscous stresses control the flow, to values large enough for the latter terms to be negligible. Steady laminar flow is considered, with uniform properties and with a single Prandtl number and radius ratio. The influences of numerical factors, such as mesh size and distribution on the predictions are considered. The study shows that numerical-simulation capabilities can largely satisfy needs for heat-transfer predictions; but only the information-on-demand mode is economically practicable. It is argued that this entails a shift in the emphasis in research from the predictions themselves to the efficiency with which more of them can be produced.
Author (ESA)

N85-11331# Thames Polytechnic, London (England). Centre for Modelling and Process Analysis.
COMPUTER SIMULATION TECHNIQUES FOR TURBULENT FLOWS
N. C. Markatos Imperial Coll. of Science and Technology Jun. 1984 118 p refs Submitted for publication
(CFD-84/11) Avail: NTIS HC A06/MF A01

The partial differential equations for turbulent, physical systems are recalled, and numerical flow prediction techniques are reviewed. Field models of turbulence; turbulence transport models (zero, one, two, and stress equation, multiscale k-epsilon models); large-eddy simulation; and two-fluid models are covered.
Author (ESA)

N85-11679# Joint Publications Research Service, Arlington, Va.
SIMILARITY CRITERIA OF SPECTRA OF PRESSURE PULSATIONS OF TURBULENT BOUNDARY LAYER NEAR WALL Abstract Only
B. M. Yefimtsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 12 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 58-61 Previously announced as N84-32059 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11699# Joint Publications Research Service, Arlington, Va.
GAS DYNAMICS OF COMBUSTION OF GAS-AIR MIXTURE IN SEMI-CLOSED SPACE WITH RELIEF OF PRESSURE INTO GASLESS ADJACENT SPACE Abstract Only
P. A. Strelchuk, A. V. Mishyyev, A. G. Nikitin, and N. V. Orakhelashvili *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 41 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk, USSR), v. 20, no. 1, Jan. - Feb. 1984 p 65-69 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11700# Joint Publications Research Service, Arlington, Va.
DEVELOPED TURBULENT FLOW UNDER CONDITIONS OF INTERNAL AND EXTERNAL PROBLEMS Abstract Only
R. F. Galimzyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 45 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 171-173 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11701# Joint Publications Research Service, Arlington, Va.
LAMINAR-TO-TURBULENT FLOW TRANSITION UNDER INFLUENCE OF ACOUSTIC OSCILLATIONS Abstract Only
A. N. Shelpyakov, A. M. Kasimov, and G. N. Isupov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 47 Transl. into ENGLISH from Inzh.-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 560-563 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11751# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF DETONATION WAVES EXCITED IN GAS DURING CONCENTRATED RELEASE OF ENERGY Abstract Only
A. V. Trotsyuk and V. Yu. Ulyanitskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 31 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 6, Nov. - Dec. 1983 p 76-82 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11753# Joint Publications Research Service, Arlington, Va.
NONSTEADY MOTION OF SOLID SPHERE IN COMPRESSIBLE VISCOUS FLUID Abstract Only
A. S. Basmat *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 32 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 19, no. 8, Aug. 1983 p 118-121 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11756# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF HEAT EXCHANGE ON MODELS IN SUBSONIC JETS OF INDUCTION PLASMATRON Abstract Only
A. N. Godeyev, A. F. Kolesnikov, and M. I. Yakushin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 39 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 6, Nov. - Dec. 1983 p 129-135 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11776# Joint Publications Research Service, Arlington, Va.
PROBLEMS IN THEORY OF DIFFUSION UNDER SHOCK WAVE Abstract Only
S. V. Zemskiy, V. A. Karpelyev, and Ryabchikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 91 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1983 p 116-119 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11781# Joint Publications Research Service, Arlington, Va.
NORMAL MODE METHOD OF SOLVING PROBLEM FORCED OSCILLATIONS OF RIB-REINFORCED SHELL OF REVOLUTION IN LIQUID Abstract Only
I. I. Vorovich, A. Ya. Tsionskiy, and A. S. Yudin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 98 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 6, Nov. - Dec. 1983 p 744-748 Original language document was announced as A84-44595 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-11332# Royal Aircraft Establishment, Farnborough (England).
PRELIMINARY RESULTS USING A RAPID PHOTOGRAPHIC WAKE TRAVERSE SYSTEM
P. B. Earnshaw Nov. 1983 12 p refs Original contains color illustrations
(RAE-TM-Aero-1987; BR92324) Avail: NTIS HC A02/MF A01

A rapid photographic wake traverse system was constructed for a 4 ft x 3 ft wind tunnel in order to assess the feasibility of, and design requirements for, a similar equipment to suit a 5 m wind tunnel. Sample photographs using a gothic wing and a Harrier model with and without stores show the ease with which useful information can be acquired. Author (ESA)

N85-11333# Varian Associates, Beverly, Mass. Microwave Div.
A NONLINEAR THEORY FOR GYRO-DEVICES Final Report
G. E. Thomas 1984 35 p
(Contract N00014-82-C-2192)
(AD-A145297) Avail: NTIS HC A03/MF A01 CSCL 12/1

Recent work on a nonlinear theory for gyro-devices (i.e., gyrotrons, gyro-twts, gyro-klystrons) is described. Differences between this work and similar work are emphasized. Comparisons are made between theoretical predictions and computer simulations. In addition, comparisons are made between theoretical predictions and 60 GHz gyrotron experimental data. Author (GRA)

N85-11334# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MULTISPECTRAL PASSIVE MICROWAVE CORRELATIONS WITH AN ANTECEDENT PRECIPITATION INDEX USING THE NIMBUS 7 SMMR M.S. Thesis
G. D. Wilke Aug. 1984 144 p
(AD-A145419; AFIT/CI/NR-84-61T) Avail: NTIS HC A07/MF A01 CSCL 14/2

Analysis of the passive microwave brightness temperatures from the Scanning Multichannel Microwave Radiometer (SMMR) aboard Nimbus 7 can infer soil moisture through an Antecedent Precipitation Index (API). This investigation involves correlation analysis between five passive microwave brightness temperature wavelengths (0.81, 1.36, 1.66, 2.80, and 4.54 cm) in two polarizations spanning a one year period. Data analysis was done by a temporal and areal approach, for both the normalized brightness temperatures and the differences in the polarized channels, for all five SMMR wavelengths. Three transformations of the polarized brightness temperatures were used to evaluate the ability of the microwave data to infer soil moisture through correlations with the API. Author (GRA)

N85-11335# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
HARMONIC EMISSION FROM HIGH POWER GYROTRON OSCILLATORS M.S. Thesis
J. L. Byerly May 1984 150 p
(AD-A145621; AFIT/CI/NR-84-43T) Avail: NTIS HC A07/MF A01 CSCL 12/1

Experimental and theoretical results are presented for the second harmonic emission from a pulsed, high power gyrotron designed for high frequency fundamental operation. This present study indicates that second harmonic emission can achieve high power levels at very high frequencies with reasonable efficiencies. Using available superconducting magnets and second harmonic operation, high power emission well into the submillimeter appears feasible. GRA

N85-11336# Naval Research Lab., Washington, D. C.
AN AUTOMATED IMMITTANCE MEASURING SYSTEM FOR ELECTROACOUSTIC TRANSDUCERS Final Report
C. M. Ruggiero and T. A. Henriquez 1 Sep. 1984 33 p
(AD-A145701; NRL-MR-5384) Avail: NTIS HC A03/MF A01 CSCL 14/2

A fully automated method of obtaining immittance loops of piezoelectric transducers has been designed to be utilized in conjunction with the Hewlett-Packard 4192A Impedance Analyzer. The algorithm determines the frequencies at maximum and minimum immittances, the series and parallel resonance frequencies, and the resonance and antiresonance frequencies as well as the mechanical quality factor of the element under test. The collected data are plotted in the form of either admittance or impedance loops with evenly spaced points. The program has been implemented successfully as a means to rapidly obtain the admittance information of various loaded and unloaded transducers and transducer elements. Author (GRA)

N85-11337# Los Alamos Scientific Lab., N. Mex.
THE ANALYSIS OF TANK CALIBRATION DATA FROM SEVERAL RUNS
A. S. Goldman and A. M. Liebetrau (Battelle Pacific Northwest Lab.) 1984 6 p refs Presented at the 25th Ann. Meeting of the Institute of Nuclear Materials Management, Columbus, Ohio, 15-18 Jul. 1984
(Contract W-7405-eng-36)
(DE84-015529; LA-UR-84-2388; CONF-840734-14) Avail: NTIS HC A02/MF A01

The experimentally determined relationship between the level of liquid and volume of liquid in a tank which is used to obtain volume estimates that correspond to liquid level measurements was analyzed. Several calibration experiments are made to estimate the calibration equation. The calibration equation is used to estimate the quantity of liquid transferred from a tank between measurement periods. Difficulties can arise when run to run differences are large relative to the precisions of liquid level and volume measurements. The problem of combining and analyzing data from two or more calibration runs is addressed. Exploratory methods such as diagnostic plots that are compatible with applicable statistical models are emphasized. DOE

N85-11338# Rome Univ. (Italy). Ist. di Fisica.
PERFORMANCE OF A LARGE AREA FLASH CHAMBER PROTOTYPE
G. Bressi (Ist. Nazionale di Fisica Nucleare, Pavia, Italy), M. Cambiaghi (Pavia Univ., Italy), E. Duscio (Pavia Univ., Italy), F. Massa (Ist. Nazionale di Fisica Nucleare, Rome), and P. Trespi (Ist. Nazionale di Fisica Nucleare, Pavia, Italy) 12 Jul. 1983 27 p refs Submitted for publication
(Nota-Interna-807) Avail: NTIS HC A03/MF A01

Flash chambers of 3mx3m area, totalling 72,000 flash tubes of 0.5cmx0.5cm cross-section, 3m long, read-out at one end by capacitive pick-up, for a neutron-antineutron experiment are described. Performance tests of a chamber prototype show a good uniformity of the efficiency over the entire area and a negligible amount of spurious firing. The recovery time is < 0.5 sec per tube. Author (ESA)

N85-11339# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
STUDY FOR A LARGE AREA UNDERGROUND DETECTOR MADE WITH ORGANIC SCINTILLATORS FOR SEARCHING FOR MAGNETIC MONOPOLES
L. Petrillo and M. Severi 25 Nov. 1983 33 p refs
(Nota-Interna-814) Avail: NTIS HC A03/MF A01

Four designs for a Grand Unified Theory magnetic monopole detector based on scintillators, with a surface of 1000 sq m are compared. An arrangement with a thick liquid scintillator is recommended. Author (ESA)

N85-11048*# Rockwell International Corp., Huntsville, Ala. Space Transportation and Systems Group.
FLUIDS EXPERIMENT APPARATUS (FEA)
Mike Martin *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 333-341 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 14B

N85-11721# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC SUBTRACTION OF IMAGES BY FOURIER PLANE RECORDING AND SPATIAL FILTRATION WITH A NARROW BEAM Abstract Only
I. S. Klimenko, S. N. Malov, and V. P. Ryabukho *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 79-80 refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 2, Sep. 1983 p 365-369 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11727# Joint Publications Research Service, Arlington, Va.
FORMATION OF RADIO IMAGES BY SCANNING AROUND CIRCLE Abstract Only
A. Ch. Belyachits, P. D. Kukharchik, and V. G. Semenchik *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 98 Transl. into ENGLISH from Dokl. Akad. Belorussk. (Minsk), v. 28, no. 2, Feb. 1984 p 123-126 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11771# Joint Publications Research Service, Arlington, Va.
SPLITTING OF SURFACE POLARITON SPECTRUM BY HOLOGRAPHIC GRATING Abstract Only
D. N. Goryachev, N. L. Dmitruk, A. M. Kamuz, and V. H. Litovchenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 77 Transl. into ENGLISH from Poverkhn.: Fiz., Khim., Mekhan. (Moscow), no. 2, Feb. 1984 p 44-47 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11774# Joint Publications Research Service, Arlington, Va.
MODELING HOLOGRAPHIC RECOGNITION SYSTEM BY USING NUMBER-THEORY CONVOLUTION TRANSFORMATION Abstract Only
B. F. Fedorov and G. Z. Khalimov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 87 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 12, Dec. 1983 p 50-51 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-11340 Texas Univ., Dallas.
HIGH REPETITION RATE NITROGEN ION LASER Ph.D. Thesis
Robert Charles Harshaw 1984 170 p
Avail: Univ. Microfilms Order No. DA8416660

The average power of a pulsed discharge laser may be increased by increasing the single pulse energy or by pulsing the laser at a higher rate without a substantial loss of single pulse energy. Single pulse energy can be enhanced by increasing the energy deposition to the medium, and by scaling to larger discharge volumes. The realization of high repetition rates (HRR's) is often accomplished by the addition of specialized power supplies, pulse-forming-networks, and laser heads. A HRR N2(+) laser was developed and its output characterized as a function of gas pressure, temperature velocity, energy deposition, and repetition rate. It is shown that a self excited superradiant device is more susceptible to HRR failure modes than a similar oscillator-amplifier arrangement, the difference arising from gain and saturation considerations. With this understanding, a HRR N2(+) oscillator-amplifier was constructed yielding pulse energies of 4.5 mJ and 0.25 W average power at 60 pps, while capable of several hour gas fill lifetimes. Dissert. Abstr.

N85-11341# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
EVALUATION OF LASER PROFILE AND DEFLECTION MEASURING SYSTEM Final Report, Aug. 1981 - Mar. 1984
Albert J. Bush, III and Gary B. Cox Washington FAA Sep. 1984 102 p refs Sponsored in part by Air Force
(Contract DTFA01-81-4-10584)
(FAA-PM-84-24) Avail: NTIS HC A06/MF A01

Lasers mounted on a 10-ft beam are used to measure pavement profiles and deflections near a loaded wheel. The lasers require no contact with the pavement surface. The algorithm for solution of the profile is presented along with the solutions for calibrating the system. The system is a promising tool for measuring surface roughness. Continued research is required to improve the system to provide the required accuracy. B.W.

N85-11342# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DIAGNOSTICS OF IONIZATION IN AIR PRODUCED BY IN-

FRARED RADIATION FROM A PULSE CO2 LASER M.S. Thesis
E. S. Huston 1984 98 p
(AD-A145376; AFIT/CI/NR-84-64T) Avail: NTIS HC A05/MF A01 CSCL 20/5

This thesis begins with a brief account of the historical development of the modern concept of the atom and, building on this foundation, the physical principles responsible for the operation of a LASER are presented. A more detailed description is then given of the pulsed CO2 LASER used in this research, including principles of operation and safety procedures. Next, the research itself is described: an analysis of the ionization in air produced by focusing the LASER's infrared radiation. The data are summarized in graphs which map the region of ionization. Following conclusions on the research performed, specific suggestions are made for future work with the LASER. GRA

N85-11343# California Univ., Santa Barbara. Quantum Inst.
SUMMARY DISCUSSION: THEORETICAL ASPECTS OF XUV FREE ELECTRON LASERS
W. B. Colson, W. Becker, S. Benson, A. Bhowmik, and R. Cover Dec. 1983 7 p
(Contracts F49620-83-C-0043; N00014-81-K-0809)
(AD-A145475; AFOSR-84-0734TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

We briefly summarize the existing knowledge on XUV operation of Free-Electron Lasers. The standard classical anlaysis is valid until about 1 Angstrom wavelength if a high energy electron beam is used. If a low energy beam is used, the limiting wavelength is larger. Other topics discussed are electron shot noise, photon statistics, photon and electron quantum effects, coherence, high-gain collective effects, higher harmonics, and transverse optical effects. Author (GRA)

N85-11344# Army Missile Command, Redstone Arsenal, Ala. Directed Energy Directorate.
TIME VARIABILITY OF DIRECTIONALITY PROPERTIES OF PULSED EB-EDL (ELECTRON BEAM-ELECTRIC DISCHARGE LASER) N2-CO2 LASERS
R. W. Jones Feb. 1984 15 p
(AD-A145546; AD-E950534; DRSMI/RH-84-3-TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Measurements were made of the time dependence of radiation intensity in various parts of the far-field patterns of pulsed e-beam electric discharge laser (EB-EDL) N2-CO2 lasers. It was found that the relative intensity of the early-time gain-switch spike as compared to the later-time main pulse was different in different portions of the far-field pattern when the resonator alignment was of fully decentered type. Author (GRA)

N85-11345# Oak Ridge National Lab., Tenn.
STUDIES OF LASER MELTING AND RAPID SOLIDIFICATION USING AMORPHOUS SILICON
D. H. Lowndes and R. F. Wood Jun. 1984 27 p refs Presented at 3rd Trieste IUPAP Semiconductor Symp. on High Excitation and Short Pulse Phenomena, Trieste, Italy, 2 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014737; CONF-840775-1) Avail: NTIS HC A03/MF A01

Pulsed laser melting of ion implantation amorphized silicon layers, and subsequent solidification were studied. Measuremens of the onset of melting of amorphous silicon layers and of the duration of melting, and modified melting model calculations demonstrated that the thermal conductivity, K/sub a/, of amorphous silicon is very low (K/sub a/approx. = 0.02 W/cm-K). The K/sub a/ is also the dominant parameter which determines the dynamical response of amorphous silicon to pulsed laser radiation. The TEM indicates that bulk nucleation occurs directly from the highly undercooled liquid silicon that can be prepared by pulsed laser melting of amorphous silicon layers at low laser energy densities. A modified thermal melting model is presented. The model calculations demonstrate that the release of latent heat by bulk nucleation which occurs during the melt in process is essential to obtain agreement with observed depths of melting. The calculations show that this release of latent heat which accompanies bulk nucleation can result in the existence of buried molten layers of silicon in the interior of the sample after the surface has solidified. The bulk nucleation implies that the liquid to amorphous phase transition cannot be explained by purely thermodynamic considerations. DOE

N85-11681# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF RADIATION WAVELENGTH ON ELASTIC PULSE SHAPE DURING LASER EXCITATION Abstract Only
V. I. Arkhipov, A. N. Bondarenko, and A. I. Kondratyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 13 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 5-9 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11704# Joint Publications Research Service, Arlington, Va.
NUMERICAL ANALYSIS OF PARAMETERS OF SELF-HEATING COPPER VAPOR LASERS Abstract Only
A. F. Galkin, I. I. Klimovskiy, and L. A. Selezneva *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 51 Transl. into ENGLISH from Teplofizika Vysokikh Temperatur (Moscow), v. 21, no. 5, Sep. - Oct. 1983 p 976-981 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11705# Joint Publications Research Service, Arlington, Va.
THE 248 nm - NEW SHORT WAVELENGTH FOR PUMPING LASERS EMPLOYING VAPORS OF COMPLEX MOLECULES Abstract Only
V. V. Gruzinskiy, K. M. Degtyarenko, T. N. Kopylova, and V. T. Pavlova *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 51-52 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Fiz. (Tomsk, USSR), v. 27, no. 4, Apr. 1984 p 118-119 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11706# Joint Publications Research Service, Arlington, Va.
SELF-MODULATION OF INJECTION LASER EMISSION INTENSITY DUE TO EXTERNAL OPTICAL FEEDBACK Abstract Only
B. I. Smiyan, D. P. Tregub, and B. B. Elenkrig *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 54 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 198-200 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11707# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TRANSLATIONAL AND HYPERFINE RELAXATION ON ENERGY CHARACTERISTICS OF OXYGEN-IODINE LASER Abstract Only
M. V. Zagidullin, V. I. Igoshin, and N. L. Kupriyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 55 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 382-385 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11708# Joint Publications Research Service, Arlington, Va.
DUAL (GaAl) As-HETEROSTRUCTURE BASED INJECTION LASER TRAVELING WAVE AMPLIFIER Abstract Only
I. S. Gondobin, V. N. Lukyanov, A. F. Solodkov, V. P. Tabunov, and S. D. Yakubovich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 56 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 375-381 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11709# Joint Publications Research Service, Arlington, Va.
TRANSIENT OPTICAL NUTATION IN CO2 LASER Abstract Only
V. Yu. Baranov, V. L. Borzenko, S. M. Kozochkin, K. N. Makarov,

D. D. Malyuta, Yu. V. Petrushevich, Yu. A. Satov, A. N. Starostin, and A. P. Streltsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 56 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 344-348 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11710# Joint Publications Research Service, Arlington, Va.
OPTICAL RECORDING OF INFORMATION ON PAPER BY CO2 AND YAG-LASERS Abstract Only
S. G. Bayev, V. P. Bessemltsev, D. V. Koronkevich, and Yu. N. Tkachuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 57 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 339-344 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11711# Joint Publications Research Service, Arlington, Va.
SOLAR-PUMPED LASERS: A REVIEW Abstract Only
A. L. Golger and I. I. Klimovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 58 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 233-257 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11712# Joint Publications Research Service, Arlington, Va.
SPECTRALLY MATCHED MODULATION OF RADIATION OF INJECTION LASER IN TRAVELING-WAVE AMPLIFIER BELOW 2 GHz Abstract Only
D. M. Annenkov, A. P. Bogatov, P. G. Yeliseyev, O. G. Okhotnikov, G. T. Pak, M. P. Rakhvalskiy, Yu. F. Fedorov, and K. A. Khayretdinov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 59 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 231-232 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11713# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF ULTRASHORT PULSE GENERATION MODE OF YAG LASER Abstract Only
M. I. Demchuk, V. P. Mikhaylov, and A. F. Chernyavskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 59 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz. (Moscow), v. 48, no. 3, Mar. 1984 p 583-586 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11714# Joint Publications Research Service, Arlington, Va.
THEORY OF FREE-ELECTRON LASERS WITH FOCUSING PUMPING FIELD Abstract Only
N. S. Ginsburg *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 61 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 2, Feb. 1983 p 299-305 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11715# Joint Publications Research Service, Arlington, Va.
MULTIFREQUENCY LIDAR BASED ON DYE LASER Abstract Only
L. D. Ganushkina, Ye. M. Gitlin, A. P. Ivanov, A. S. Kovalchuk, I. R. Korotkin, M. M. Loyko, F. P. Osepenko, and A. P. Chaykovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 62-63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 690-695 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11716# Joint Publications Research Service, Arlington, Va.
NARROWBAND TUNABLE DYE LASER WITH AMPLIFIER PUMPED BY POWERFUL NITROGEN LASER Abstract Only
S. N. Dorofeyev, A. G. Klimashina, V. Ye. Mnushkin, V. G. Nikiforov, B. F. Trinchuk, A. N. Tokareva, and V. A. Fedorov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 686-690 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11717# Joint Publications Research Service, Arlington, Va.
BIAXIAL-CRYSTAL LASER WITH WAVEGUIDE RESONATOR Abstract Only
B. B. Boyko, I. M. Vashkevich, Ye. A. Kashpar, I. P. Petrovich, N. N. Uvarova, and A. P. Shkadarevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 683-686 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11718# Joint Publications Research Service, Arlington, Va.
LINEAR THEORY OF FREE-ELECTRON LASERS WITH CYLINDRICAL INTERACTION SPACE Abstract Only
N. I. Karbushev, A. A. Rukhadze, and A. D. Shatkus *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 68-69 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 534-540 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11719# Joint Publications Research Service, Arlington, Va.
LASER SOURCE OF NEUTRAL ATOMS FOR COLLECTIVE-FIELD PARTICLE ACCELERATOR Abstract Only
Yu. A. Bykovskiy, V. Ye. Mironov, V. P. Sarantsev, S. M. Silnov, Ye. A. Sotnichenko, Z. A. Ter-Martirosyan, and B. A. Shestakov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 71-72 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 527-533 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11728# Joint Publications Research Service, Arlington, Va.
NUMERICAL INVESTIGATION OF CHARACTERISTICS OF CURRENT FLOW FOR DIFFERENT METHODS OF OBTAINING DISCHARGE IN HIGH SPEED LASERS. MECHANISM UNDERLYING CURRENT FLOW IN POSITIVE GLOW DISCHARGE COLUMN Abstract Only
V. V. Breyev, S. V. Dvurechenskiy, and S. V. Pashkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 99 Transl. into ENGLISH from Teplofiz. Vysokikh Temperatur (Moscow), v. 21, no. 5, Sep. - Oct. 1983 p 865-870 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11740# Joint Publications Research Service, Arlington, Va.
NONLINEAR ABSORPTION OF LASER RADIATION IN InP AND IN GaAs Abstract Only
R. A. Bendoryus and E. K. Maldutis *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 6 Transl. into ENGLISH from Litovsk. Fiz. Sb. (Vilnius), v. 34, no. 5, Sep. - Oct. 1983 p 92-96 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11758# Joint Publications Research Service, Arlington, Va.
SPACE-TIME CHARACTERISTICS OF RADIATION OF SINGLE-MODE INJECTION LASERS Abstract Only
V. I. Borodulin, M. V. Zverkov, V. P. Konyayev, A. L. Lamanov, S. A. Pashko, M. B. Trapeznikov, and V. I. Shveykin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 40-41 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 53, no. 12, Dec. 1983 p 2408-2410 Original language document was announced as A84-44130 (For primary document see N85-11737 02-76)
Avail: NTIS HC A06/MF A01

N85-11759# Joint Publications Research Service, Arlington, Va.
THEORETICAL ANALYSIS OF PHYSICAL PROCESSES OF LASING MEDIUM DEGRADATION IN SEMICONDUCTOR LASERS Abstract Only

P. G. Yeliseyev, I. N. Zavestovskaya, I. A. Poluektov, and Yu. M. Popov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 44 Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. imeni P. N. Lebedeva Akad. Nauk SSSR: Inzhektsionnyye Lazery (Moscow), v. 141, 1983 p 154-185 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11760# Joint Publications Research Service, Arlington, Va.
STUDY OF CW INJECTION LASER WITH A DISPERSIVE EXTERNAL CAVITY Abstract Only
A. P. Bogatov, P. G. Yeliseyev, O. G. Okhotnikov, G. T. Pak, S. A. Pashko, M. P. Rakhvalskiy, and K. A. Khayretdinov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 45-46 Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. imeni P. N. Lebedeva Akad. Nauk SSSR: Inzhektsionnyye Lazery (Moscow), v. 141, 1983 p 62-88 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11761# Joint Publications Research Service, Arlington, Va.
INJECTION LASERS BASED ON AlGaAsSb/GaSb AND InGaAsSb/GaSb HETEROSTRUCTURES Abstract Only
L. M. Dolginov, A. Ye. Drakin, V. Drushinina, P. G. Yeliseyev, M. G. Milvidskiy, B. N. Sverdlov, and V. A. Skripkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 46-47 Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. imeni P. N. Lebedeva Akad. Nauk SSSR: Inzhektsionnyye Lazery (Moscow), v. 141, 1983 p 46-61 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11762# Joint Publications Research Service, Arlington, Va.
LASER ON COPPER AND GOLD VAPORS WITH SPACE DIVERSITY MEDIA Abstract Only
G. S. Yevtushenko, A. Ye. Kirilov, Yu. P. Polunin, A. N. Soldatov, and V. F. Fedorov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 50 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 29, no. 6, Dec. 1983 p 939-944 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11763# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF LASING DYE MEDIA IN PUMPING HIGH-POWER RADIATION WITH NANOSECOND PULSES Abstract Only
S. A. Batishche, V. A. Ganzha, N. A. Malevich, V. A. Mostovnikov, D. I. Perlov, and V. P. Shifrin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 51 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 29, no. 6, Dec. 1983 p 934-938 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11764# Joint Publications Research Service, Arlington, Va.
OPTICAL PROPERTIES OF LASER EROSION FLARES IN PLASMA Abstract Only
V. K. Goncharov, L. Ya. Minko, and V. I. Nasonov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 51-52 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 29, no. 6, Dec. 1983 p 930-934 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11765# Joint Publications Research Service, Arlington, Va.
ANOMALIES IN FREQUENCY CHARACTERISTICS OF SOLID-STATE RING LASER Abstract Only
A. V. Dotsenko, Ye. G. Lariontsev, and A. N. Shelayev *In* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 57 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 20-25 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11766# Joint Publications Research Service, Arlington, Va.
OPTIMIZING CW CO2 LASERS WITH RESPECT TO OUTPUT POWER IN DIFFERENT BANDS Abstract Only
V. O. Petukhov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 59 Transl. into ENGLISH from Dokl. Akad. Nauk BSSR (Minsk), v. 27, no. 10, Oct. 1983 p 893-896 Original language document was announced as A84-11324 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11772# Joint Publications Research Service, Arlington, Va.
USING TWO-BEAM INTERFERENCE METHOD FOR MEASURING WAVELENGTH OF TUNABLE PULSE LASERS Abstract Only
V. V. Arkhipov, A. L. Kurbatov, and M. V. Shubin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 78-79 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 12, Dec. 1983 p 5-7 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-11346# Southampton Univ. (England). Institute of Sound and Vibration Research.
VIBRATIONAL POWER TRANSMISSION OF AN IDEALISED GEARBOX
E. C. N. Leung Jun. 1984 96 p refs
(Rept-124) Avail: NTIS HC A05/MF A01

The vibrational power transmission of an idealized gearbox or electric motor was analyzed. It is shown that a journal bearing with a high eccentricity ratio has smaller effect on the power transmission process than a journal bearing with a low eccentricity ratio. In the analyses of the point inertances, it was found that the local stiffness at the point of the application force governs the antiresonance. The first resonance of the idealized gearbox configuration is estimated with reasonable accuracy using the result of the point inertance of an infinite plate. The transfer inertance was examined on an aluminum disc. The results agree well with the theoretical predictions. E.A.K.

N85-11347# Applied Concepts Corp., Woodstock, Va.
ROBOTICS INVESTMENT DECISION MODEL USER'S MANUAL Report, 21 Feb. - 2 May 1982
J. A. Simpson 4 May 1984 88 p
(Contract F33615-83-C-5080)
(AD-A145467; BRMC-83-5080-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes how to use the Robotics Investment Decision Model (RIDM). RIDM is a computerized model for assessing the economic attractiveness of investments in robotics and/or flexible manufacturing systems. It is written as a template for Lotus 1-2-3, a popular microcomputer-based electronic spreadsheet program. RIDM models the nominal and discounted cash flows generated by the investment as compared to the existing method of manufacture, and provides the internal rate of return and net present value of the investment, both before and after taxes. Author (GRA)

N85-11348# CRC Automatic Welding Co., Houston, Tex.
DESIGN, CONSTRUCTION, DEMONSTRATION AND DELIVERY OF AN AUTOMATED NARROW GAP WELDING SYSTEM Report, 1 Apr. - 30 Sep. 1983
30 Sep. 1983 36 p
(Contract N00600-81-C-E923)
(AD-A145497; CRC-NAV-A/W-8; RP-4) Avail: NTIS HC A03/MF A01 CSCL 13/10

The objective of this program is to design, construct, demonstrate, and deliver an automated, Narrow Gap welding system capable of welding high strength steel plates under shipyard

production conditions in the construction of aircraft carriers. The program is being conducted in five phases: (1) Definition of Requirements; (2) Design of Welder Package; (3) Equipment Construction; (4) Qualification of Process and Equipment; and (5) Shipyard Demonstration. GRA

N85-11349# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
CLEAN-BURNING DIESEL ENGINES Interim Report, Sep. 1982 - Aug. 1983
H. E. Dietzmann Aug. 1983 74 p
(Contract DAAK70-82-C-0001)
(AD-A145515; AFLRL-169) Avail: NTIS HC A04/MF A01 CSCL 21/7

Gaseous and particulate emissions were measured from two diesel forklift engines under a variety of steady-state conditions. A MIL-F-46162A(MR) military referee grade fuel was used to determine CO, CO2, NOx, HC, particulate, sulfate, organic sulfides, phenols, DOAS odor, sulfur dioxide and aldehyde emission rates from a Deutz F3L 912W and a Perkins 4.203.2 diesel engine. Emission rates were reported in g/hp-hr, g/hr, and observed concentration, i.e., ppm, percent, or g/cu m. GRA

N85-11350# South Dakota Univ., Springfield.
CONVERTING GASOLINE FARM TRACTORS TO RUN EFFICIENTLY ON FARM-PRODUCED ALCOHOL
J. E. Watembach 16 Jan. 1984 8 p refs
(Contract DE-FG84-81R8-06002)
(DE84-015796; DOE/R8-06002/T1) Avail: NTIS HC A02/MF A01

The conversion from gasoline to alcohol for use in farm equipment was explored. Fuel consumption was tested with the pistons installed for a compression ratio of 12.5/1. The tractor developed more horsepower at this higher compression ratio than it had on alcohol or gasoline. It is found that increased fuel efficiency and better performance can be achieved by increasing the compression ratio. Heating the intake air also helps overall performance of operation. It is concluded that it is possible to burn 170 proof alcohol in a farm tractor with a minor amount of change. DOE

N85-11351# Oak Ridge National Lab., Tenn.
LIQUID-PISTON STIRLING MACHINES
C. D. West 1984 19 p refs Presented at 2nd Intern. Stirling Engine Conf., Shanghai, 12 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014255; CONF-8406169-1) Avail: NTIS HC A02/MF A01

Since the invention of the Fluidyne engine in 1969, the potential of liquid piston Stirling machine designs of a wide variety of applications, including water pumping from solar heat, simple and long lived fossil fuel fired irrigation pumps, and heat powered heat pumps has been described. A substantial amount of theoretical work was published, along with experimental results from a number of very different machines and design data for the construction of experimental engines. The progress and the performance of existing systems is described, outstanding research needs are identified, and some of the potential for further progress is outlined. DOE

N85-11352# Oak Ridge National Lab., Tenn.
STANDARDIZED EFFICIENCY TERMS: COMPARISON OF SOME STIRLING ENGINE PERFORMANCE FIGURES
J. L. Crowley 1984 7 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE84-015407; CONF-840804-31) Avail: NTIS HC A02/MF A01

Thermal efficiencies are the quality indicators of the performance of any energy system. Most energy systems use acceped terminology which allows comparative evaluations. There is no widely accepted standard terminology in use for Stirling engine systems, and researchers devise their own. A suggested terminology that provides a common basis for reporting efficiencies was given wide distribution, and requests were made for data contributions in the suggested format. Some of the results are presented, along with others obtained by the application of the standardized terms to both published and unpublished data. DOE

N85-11353# Barber-Nichols Engineering Co., Arvada, Colo.
TURBINE TEST REPORT, ADDENDUM Final Report
T. J. Elliott and W. D. Batton Jul. 1984 25 p
(Contract DE-AC03-81CS-30576)
(DE84-015130; DOE/CS-30576/T2) Avail: NTIS HC A02/MF A01

The radial inflow turbine 25 ton solar air conditioner was tested. By using the converging only nozzles designed for this system, a peak efficiency of 86% was measured at a pressure ratio of 2.7 and a velocity ratio of 0.66. Near the design pressure ratio of 3.5 and velocity ratio of 0.645, the measured pressure ratio of 3.5 and velocity of 0.645, the measured efficiency was 84% instead of the predicted 82%. Data are presented for pressure ratios of 2.7, 3.6, and velocity ratio ranges of 0.20 to 0.85. This covers the normal operating range of interest in this machine. It is found that the performance is better than predicted which indicates that some of the loss coefficient values assumed during the original analysis are conservative. DOE

N85-11354# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Versuchs- und Forschungsanlage.
THE KZD-85 ENGINE TEST. ENGINE TYPE: 1 CYLINDER, 2 STROKE MOTOR 2100 HUSQUARNA [KZD-85 MOTOR-VERSUCH: MOTORTYPE: 1 ZYL. 2-TAKT-MOTOR 2100 HUSQUARNA]
Buck Arthur 24 Apr. 1984 26 p In GERMAN
(FWE-FO-1717) Avail: NTIS HC A03/MF A01

A 1 cylinder 2 stroke piston engine was tested in a temperature range of minus 25 C to plus 40 C and in an altitude range from 0 to 3000 m. Fuel type, mixture regulation, starting behavior, throttle characteristics, engine speed to thrust ratio, thrust to altitude ratio, and carburetor icing were studied. Author (ESA)

N85-11077# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON HAND TOOL USED IN COSMONAUT EVA Abstract Only
G. Lomanov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 40 Transl. into ENGLISH from Sotsialitsicheskaya Ind. (Moscow), 27 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11078# Joint Publications Research Service, Arlington, Va.
FURTHER DETAILS IN WELDING, SPRAY-COATING TOOL Abstract Only
A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 41 Transl. into ENGLISH from Ivz. (Moscow), 27 Jul. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11374# Indian Inst. of Tech., Madras. Dept. of Applied Mechanics.
ANALYSIS OF TURBOMACHINE BLADES: A REVIEW
V. Ramamurti and P. Balasubramanian *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 3 Aug. 1984 p 13-28 refs (For primary document see N85-11372 02-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-11355 Arizona Univ., Tucson.
EFFICIENT METHODS FOR MECHANICAL AND STRUCTURAL

RELIABILITY ANALYSIS AND DESIGN Ph.D. Thesis
Yih-Tsuen Wu 1984 233 p
Avail: Univ. Microfilms Order No. DA8415057

Three fundamental problems of mechanical reliability are addressed: (1) computing the probability of failure, P sub f, of a component having design factors with known statistical distributions and a limit state with a closed form algebraic expression; (2) computing the probability of failure of a component having design factors with known distributions and a limit state which can only be expressed by a computer algorithm, and (3) deriving safety check expressions in a design by reliability approach. An algorithm for generating estimates of P sub f is presented. The method is an extension of the widely used Rackwitz-Fiessler (R-F) method--a fast and efficient numerical method for performing reliability analysis. A method is proposed for computing P sub f when the relationship between design factors can be defined only using a computer algorithm. A second order polynomial is constructed to approximate the limit scale in the neighborhood of the design point. Methods of deriving safety check expressions for design codes and design criteria documents are studied.
Dissert. Abstr.

N85-11356 British Library Lending Div., Boston Spa (England).
MODERNIZATION OF IDTs-6 ULTRASONIC INSTALLATION
L. S. Pugach, A. I. Kharchevnikov, N. P. Shulgina, P. P. Gusev, and B. G. Cherkashchenko 18 Jul. 1984 4 p Transl. into ENGLISH from Stal (USSR), no. 11, 1983 p 58
(BLL-M-35716-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The modernization of the IDTs-6 immersion installation for ultrasonic back pulse inspection of pipe quality is reported. The immersion method of inspection is replaced by a slit-contact method, which has increased the speed of pipe inspection, improved its reliability, and reduced repair and operational costs. Technical data of the modernized installation are presented.
E.A.K.

N85-11357# Florida State Univ., Tallahassee. Dept. of Statistics.
COMPUTING THE RELIABILITY OF k OUT OF n SYSTEMS
P. J. Boland and F. Proschan Oct. 1983 14 p
(Contract F49620-82-K-0007)
(AD-A145505; AFOSR-84-0715TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document surveys some of the more important theoretical results about the structure of the reliability function of a k out of n system, and indicates how these results may be used to obtain easily calculable bounds for the reliability of a specified k out of n system. Author (GRA)

N85-11358# North Carolina Univ., Charlotte. Dept. of Mathematics.
LIFE DISTRIBUTION PROPERTIES OF DEVICES SUBJECT TO DETERIORATION Interim Scientific Report, 1 Jul. 1983 - 30 Jun. 1984
M. Abdel-Hameed 27 Jul. 1984 13 p
(Grant AF-AFOSR-0245-80)
(AD-A145554; AFOSR-84-0725TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research during this period concentrated on the following areas: (1) life distribution properties of devices subject to a pure jump damage process; (2) a power transformation exponential regression model for censored failure time data; (3) stability of optimal replacement problems; (4) an iterative scheme for approximating optimal replacement policies; and (5) stability of optimal stopping problems. This report summarizes progress in these areas. Author (GRA)

N85-11359# South Carolina Univ., Columbia. Dept. of Mathematics and Statistics.
ON DISCRETE FAILURE MODELS
W. J. Padgett and J. D. Spurrier 17 Jul. 1984 21 p
(Grant AF-AFOSR-0156-84)
(AD-A145579; TR-97; Rept-62N05-10; AFOSR-84-0667TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

In some situations, discrete failure time distributions are more appropriate to model lifetimes than continuous distributions. Very few results for the discrete case have been given in the literature. This paper provides three families of discrete parametric lifetime distribution which are quite versatile in fitting Increasing Failure Rate (IFR) and Decreasing Failure Rate (DFR), and constant failure rate models to either uncensored or right-censored life-test data. The maximum likelihood estimation (MLE) of parameters, survival probabilities, and mean lifetimes are investigated, and the MLEs are shown to be easily computed by simple numerical methods. An example is given for each of the models, allowing the comparison of the proposed models. The example illustrates that the discrete models presented can provide a better fit to discrete data than previously proposed discrete distributions. GRA

N85-11360# Electronique Serge Dassault, St. Cloud (France).
INVESTIGATION OF THE APPLICATION OF THE MARGINAL TENSION TECHNIQUE TO TEST ELECTRONIC DEVICES, PHASE 3 Final Report [ETUDE DE L'APPLICATION DE LA TECHNIQUE DES TENSIONS MARGINALES COMME MOYEN D'ANALYSE DES COMPOSANTS ELECTRONIQUES, PHASE 3]
Auvert (Centre National d'Etudes de Telecommunications) and Huet Paris ESA 7 Feb. 1984 21 p In FRENCH
(ESD-11-301; ESA-CR(P)-1892) Avail: NTIS HC A02/MF A01

Optical laser beams and electron beams for the detection and localization of physical anomalies of integrated circuits were assessed. Tests were done on CMOS integrated circuits of the 4000 series. It is shown that the laser technique is easier to use since no vacuum is required. Higher laser wavelength use results in deeper penetration. The development of automatic testing equipment using laser stimulation is possible. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-11361 Carnegie-Mellon Univ., Pittsburgh, Pa.
A RIGID BODY MECHANISM IN STRUCTURAL DYNAMICS Ph.D. Thesis
Robert Harry Allen 1984 161 p
Avail: Univ. Microfilms Order No. DA8414731

A rigid body mechanism which was identified in a precast concrete building system is addressed. The building is idealized as an assembly of two dimensional rigid rectangular bodies subjected to self-imposed kinematic constraints. The corresponding nonlinear equations of motion have discontinuous coefficients, and are non-autonomous under time dependent excitation. Although the linearized SDOF model possesses a piecewise exponential solution, the free vibration phase plane representation demonstrates that motion is asymptotically stable. Forced response of the linearized SDOF system demonstrates that the system is poorly conditioned, in that small changes in the input can dramatically change the response. Forced vibration studies are performed on the linearized equations of the two and three degree of freedom systems and show that the system is poorly conditioned and can behave anomalously. A whipping effect in the upper stories is also observed to occur in many, but not all, cases. Failure curves are also generated for these systems by performing a systematic series of time histories. Dissert. Abstr.

N85-11362 Case Western Reserve Univ., Cleveland, Ohio.
STUDIES ON RELIABILITY OF STRUCTURAL SYSTEMS

Ph.D. Thesis
Mohammad Reza Rashedi 1984 193 p
Avail: Univ. Microfilms Order No. DA8414047

Reliability of framed structures are studied assuming that loads and component strengths are random variables. The main goal is to develop second moment (mean and variance) methods for evaluating system performance. Linear programming techniques are first developed to identify a ductile structure failure mode and its failure equation. A bounded variable simplex algorithm and duality in linear programming (LP) are used to determine the coefficients of strength terms in the failure mode expression. The method is extended to identify a failure mode for a structure under simultaneous multiple load variables. The duality in linear programming is again used to determine the coefficients of strength terms in the failure mode expression. Enumeration of significant failure modes is carried out using sensitivity and simulation approaches in conjuction with LP methods. Incremental load model previously used to identify a failure mode and its expression for ductile and brittle behaviors, is extended to semi-brittle failure of components. In the case of brittle failure, an efficient technique is introduced which determines the force distribution due to the brittle failure of component(s). Dissert. Abstr.

N85-11363 Connecticut Univ., Storrs.
EFFECTS OF MEMBER IMPERFECTIONS ON THE BEHAVIOR OF SPACE TRUSSES Ph.D. Thesis
Gary Douglas Smith 1984 254 p
Avail: Univ. Microfilms Order No. DA8416109

The effects of imperfections on the behavior of a compression member were determined as well as the effects of the member imperfections on the behavior of pin-ended space trusses. Based on the results, quantitative conclusions were made as to the effects of the member imperfections, as well as qualitative conclusions. An analytical model is developed to predict the behavior of an axially loaded compression member that is restrained by a structure surrounding it, has initial out-of-straightness, is eccentrically loaded at its ends, and/or has residual stresses present. The member cross-sections modelled are tubular and built-up cruciforms. The behavior includes both elastic and inelastic pre-buckling behavior, the formation of a plastic hinge, and the post-buckling behavior of the member. A computer model approximating the analytical member model developed, is presented. The Multiple-Step-Up Linearization method, developed during this research to approximate the member's inelastic behavior, is described. The member computer model developed is used to predict the behavior and ultimate load capacity of eight truss configurations. Dissert. Abstr.

N85-11364 Southern Methodist Univ., Dallas, Tex.
AEROELASTIC STABILITY ANALYSIS WITH INTERACTING STRUCTURAL NONLINEARITIES Ph.D. Thesis
Craig Lawrence Lee 1984 176 p
Avail: Univ. Microfilms Order No. DA8415029

The describing function approach to system linearization is successful in nonlinear flutter analysis because of its accuracy and versatility in handling a wide variety of nonlinearities with relative ease. However, difficulty occurs when many nonlinearities are present and knowledge of the oscillatory amplitude of each is required before the describing functions can be employed. To resolve this problem the theoretical development of an iterative procedure in the frequency domain is presented and involves alignment of the amplitudes in each nonlinear spring with the describing function predictions of stiffness prior to computing the final stability characteristics. The result is a system tuned to the flutter frequency at the time of instability. To support the development and validation of the procedure several describing functions are formulated and a quantitative measure of the errors in each is presented. Validation of the iterative method is accomplished through examples involving dynamic systems of increasing complexity coupled with state of the art representations of the unsteady aerodynamic forces. Both numerical simulations and experimental data are used to compare with the iterative predictions. Dissert. Abstr.

N85-11365 Rice Univ., Houston, Tex.
POST BUCKLING BEHAVIOR OF A CIRCULAR ROD CONSTRAINED WITHIN A CIRCULAR CYLINDER Ph.D. Thesis
Kenneth Gordon Sorenson 1984 172 p
Avail: Univ. Microfilms Order No. DA8416562

An axially loaded weightless circular rod buckles helically when constrained within a circular cylinder. The effects of pinned and fixed end conditions on the behavior of such a helicaly buckled rod are investigated. Both end conditions are found to perturb the helix in an exponentially decaying manner for a distance of less than one pitch length. Far from the end, the rod behaves as an undisturbed constant-pitch helix. The distance from the rod end to the point of initial contact with the cylinder wall is calculated. Closed form analytical solutions are obtained for the deflected shapes and internal reactions of the end sections. The solution procedure applies to rods of either finite or infinite length. Experimental results confirm the analytical findings. Dissert. Abstr.

N85-11366 Virginia Polytechnic Inst. and State Univ., Blacksburg.
STRESS ANALYSIS OF PIN-LOADED ORTHOTROPIC PLATES USING ORTHOTROPIC PHOTOELASTICITY Ph.D. Thesis
Dahsin Liu 1984 204 p
Avail: Univ. Microfilms Order No. DA8415962

To simulate composite pin-loaded connectors, transparent orthotropic plates made of glass/epoxy were loaded through a hole by a steel pin. The plates were approximately 50% volume fraction of glass. Due to the birefringent effect of the glass and epoxy, photoelastic fringe patterns were generated by the loading. Three plates, a quasi-isotropic, an angle-ply, and a unidirectional plate, were tested. An isotropic plate was tested for comparison. Using orthotropic stress-optic laws and a stress-separation scheme, the stresses at the hole edge and at other points in the plate were computed. These results are compared with data available from previous investigations. The stress-optic laws of previous investigators were modified to include the effect of residual birefringence. It was concluded that orthotropic photoelasticity is not as accurate as the classical isotropic counterpart.
Dissert. Abstr.

N85-11367 Rice Univ., Houston, Tex.
ACCELERATION WAVES Ph.D. Thesis
Michael Joseph Scheidler 1984 415 p
Avail: Univ. Microfilms Order No. DA8416559

Three-dimensional acceleration waves are studied for a large class of materials which includes nonlinear elastic materials, finite linear viscoelastic materials, elastic-plastic materials, hypo-elastic materials, and materials with fading memory. The material is allowed to be inhomogeneous, anisotropic and undergoing an arbitrary motion ahead of the wave. The singular surface theory of continuum mechanics can be used to investigate the effect of material motions ahead of the wave on the growth of the wave amplitude. Results are expressed in terms of the Cauchy stress tensor and the geometry of the wave in the current configuration, and also in terms of the Piola-Kirchoff stress tensor and the geometry of the wave in the reference configuration. The general formulae are applied to plane waves in laminated elastic plates and cylindrical waves in laminated cylindrical shells. Dissert. Abstr.

N85-11368 Michigan State Univ., East Lansing.
A CONSTITUTIVE MODELING TECHNIQUE BASED ON A GENERALIZED RHEOLOGICAL MODEL TO PREDICT THE RESPONSE OF MATERIALS Ph.D. Thesis
Barry Louis Spletzer 1984 91 p
Avail: Univ. Microfilms Order No. DA8415260

A new constitutive modeling technique is developed that is capable of predicting typical uniaxial materials behavior at room and elevated temperatures. Simulation of the time-independent phenomena of cyclic hardening or softening, cyclic relaxation of mean stress and history dependent memory, and the time dependent behavior of creep and stress relaxation is accomplished. This constitutive model is based on generalized analysis of any configuration of classical rheological model elements and special purpose elements developed specifically for this constitutive

modeling technique. In all cases the model predictions followed the general trend of the experimental data. Correlation with the majority of the experimental data is very good. Dissert. Abstr.

N85-11369 Princeton Univ., N. J.
FINITE ELEMENT ANALYSIS OF THERMOELASTICITY PROBLEMS Ph.D. Thesis
David Da-Juin Tao 1984 173 p
Avail: Univ. Microfilms Order No. DA8415535

A general and efficient finite element procedure is proposed to analyze transient phenomena in thermoelastic solids. Green and Lindsay's dynamic thermoelastic equations are selected for that purpose since they reduce to classical equations by appropriate choice of the parameters, and allow for so-called second sound effects. Several types of heat boundary conditions are considered. They include convective, radiative and enclosure radiative boundary conditions. The material properties are assumed temperature-dependent. Integration of the resulting nonlinear semi-discrete finite element equations is performed by using an implicit/explicit predictor/multi-corrector scheme. The procedure allows for a convenient selection of implicit and explicit elements, and proves to be most effective and versatile in thermal and stress wave propagation analysis. Accuracy and versatility of the proposed model are demonstrated by applying it to obtain solutions to several thermoelasticity problems. It is shown that an implicit treatment of the boundary terms always results in very significant savings over an explicit treatment. Dissert. Abstr.

N85-11370 Virginia Polytechnic Inst. and State Univ., Blacksburg.
QUASI-NEWTON ALGORITHMS FOR LARGE SCALE NON-LINEAR SYSTEMS Ph.D. Thesis
Dennis Jay VandenBrink 1983 172 p
Avail: Univ. Microfilms Order No. DA8415975

A number of quasi-Newton algorithms and strategies for sparse, symmetric Hessian matrices was evaluated. It was shown how these quasi-Newton algorithms could be applied to the unconstrained minimization of a nonlinear function as well as a nonlinear least squares approach to solving a system of nonlinear equation. The best of these algorithms were evaluated for a problem with a fairly large number of degrees of freedom with a large load increment. It is concluded that the proposed quasi-Newton method with the double dogleg strategy and an automatic control on Hessian evaluations is the best algorithm for all of the problems considered. The algorithm had no difficulty converging to solutions regardless of the size of the model and regardless of the size of the load or time step. The advantage of being able to take large load or time steps may lie in those problems which involve the location of critical points (limit or bifurcation points) of structures with minimal computational effort. All the algorithms which utilized the double dogleg strategy were consistently better able to converge to the solution. Dissert. Abstr.

N85-11371# Royal Aircraft Establishment, Farnborough (England).
MODEL FOR NON-LINEAR CRACK GROWTH PREDICTION, TAKING LOAD SEQUENCE (LOSEQ) EFFECTS INTO CONSIDERATION
H. Fuehring 23 Oct. 1984 86 p refs Transl. into ENGLISH of "Modell zur Nichtlinearen Rissfortschrittsvorhersage unter Beruecksichtigung von Lastreihenfolge-Einfluessen (LOSEQ)" rept. FB-162 Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt, West Germany, 1982
(BLL-RAE-Trans-2114-(5207)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

An analytical model for predicting nonlinear crack growth which considers the retardation and the acceleration effects due to irregular loading is presented. The maximum peak of a load sequence to effect crack growth and all other loads of the history according to a generalized memory criterion are considered. Comparisons between crack growth predicted by using the LOSEO program and experimentally observed data are presented. E.A.K.

N85-11372# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 16, NO. 8 Monthly Report
Judith Nagle-Eshleman, ed. Aug. 1984 117 p refs
(AD-A145653) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

Articles addressing hardware and software selection for modal analysis and the analysis of turbomachine blades and disks are presented. In addition, book reviews, course offerings, news briefs, and a bibliography of current literature containing 109 citations are provided. For individual titles, see N85-11373 through N85-11374.

N85-11373# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
HARDWARE AND SOFTWARE SELECTION FOR EXPERIMENTAL MODAL ANALYSIS c61
C. W. deSilva *In* Shock and Vibration Information Center. The Shock and Vibration Digest, Vol. 16, No. 3 Aug. 1984 p 3-10 refs (For primary document see N85-11372 02-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

Several basic issues that should be considered in selecting a commercial stand-alone modal analysis system are examined from the point of view of hardware and software capabilities. In particular, determination of transfer functions via FFT analysis; extraction of natural frequencies; modal damping ratios and mode shapes from transfer function data; and the construction of mass, stiffness, and damping matrices from modal data are discussed. Four commercially available modal analysis systems are considered in a comparative evaluation. M.G.

N85-11374# Indian Inst. of Tech., Madras. Dept. of Applied Mechanics.
ANALYSIS OF TURBOMACHINE BLADES: A REVIEW c37
V. Ramamurti and P. Balasubramanian *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 3 Aug. 1984 p 13-28 refs (For primary document see N85-11372 02-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

Literature addressing the static and dynamic analysis of turbine blades and discs is reviewed. The various formulations and solutions of linear and nonlinear vibrations of blades and discs are summarized. Experimental methods are also discussed. Author

N85-11375*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
MATERIALS PROPERTIES, LOADS, AND STRESS ANALYSIS, SPARTAN REM: APPENDIX A
Donna S. Marlowe and Erik J. West 19 Jun. 1984 124 p 2 Vol.
(Contract NAS8-35599)
(NASA-CR-171092; NAS 1.26:171092;
LMSC-HREC-PR-D951498-A) Avail: NTIS HC A06/MF A01 CSCL 20K

The mechanical properties, load tests, and stress analysis of the Spartan Release Engagement Mechanism (REM) is presented. The fracture properties of the components of the unit are also discussed. Detailed engineering drawings are included. M.A.C.

N85-11376*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
COMPUTER MODELS AND OUTPUT, SPARTAN REM: APPENDIX B
Donna S. Marlowe and Erik J. West 19 Jun. 1984 604 p 2 Vol.
(Contract NAS8-35599)
(NASA-CR-171093; NAS 1.26:171093;
LMSC-HREC-PR-D951498-B) Avail: NTIS HC A99/MF A01 CSCL 20K

A computer model of the Spartan Release Engagement

Mechanism (REM) is presented in a series of numerical charts and engineering drawings. A crack growth analysis code is used to predict the fracture mechanics of critical components. M.A.C.

N85-11377# Southampton Univ. (England). Institute of Sound and Vibration Research.
POWER FLOW BETWEEN NON-CONSERVATIVELY COUPLED OSCILLATORS
F. J. Fahy and D. Yao Aug. 1984 21 p refs
(ISVR-TR-125) Avail: NTIS HC A02/MF A01

The power flow between two non-conservative oscillators coupled by spring and damping elements is studied, and an analytical expression of power flow is derived. It is found that the new terms caused by the presence of the coupling damping element are added to the expression for power flow between conservatively coupled oscillators. R.S.F.

N85-11378*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STARS: A GENERAL-PURPOSE FINITE ELEMENT COMPUTER PROGRAM FOR ANALYSIS OF ENGINEERING STRUCTURES
K. K. Gupta Oct. 1984 68 p refs
(NASA-RP-1129; H-1224; NAS 1.61:1129) Avail: NTIS HC A04/MF A01 CSCL 20K

STARS (Structural Analysis Routines) is primarily an interactive, graphics-oriented, finite-element computer program for analyzing the static, stability, free vibration, and dynamic responses of damped and undamped structures, including rotating systems. The element library consists of one-dimensional (1-D) line elements, two-dimensional (2-D) triangular and quadrilateral shell elements, and three-dimensional (3-D) tetrahedral and hexahedral solid elements. These elements enable the solution of structural problems that include truss, beam, space frame, plane, plate, shell, and solid structures, or any combination thereof. Zero, finite, and interdependent deflection boundary conditions can be implemented by the program. The associated dynamic response analysis capability provides for initial deformation and velocity inputs, whereas the transient excitation may be either forces or accelerations. An effective in-core or out-of-core solution strategy is automatically employed by the program, depending on the size of the problem. Data input may be at random within a data set, and the program offers certain automatic data-generation features. Input data are formatted as an optimal combination of free and fixed formats. Interactive graphics capabilities enable convenient display of nodal deformations, mode shapes, and element stresses. R.J.F.

N85-11379*# University of Southern California, Los Angeles.
APPROXIMATION METHODS FOR INVERSE PROBLEMS INVOLVING THE VIBRATION OF BEAMS WITH TIP BODIES Final Report
I. G. Rosen Sep. 1984 12 p refs
(Contract NAS1-17070)
(NASA-CR-172468; NAS 1.26:172468; ICASE-84-51) Avail: NTIS HC A02/MF A01 CSCL 20K

Two cubic spline based approximation schemes for the estimation of structural parameters associated with the transverse vibration of flexible beams with tip appendages are outlined. The identification problem is formulated as a least squares fit to data subject to the system dynamics which are given by a hybrid system of coupled ordinary and partial differential equations. The first approximation scheme is based upon an abstract semigroup formulation of the state equation while a weak/variational form is the basis for the second. Cubic spline based subspaces together with a Rayleigh-Ritz-Galerkin approach were used to construct sequences of easily solved finite dimensional approximating identification problems. Convergence results are briefly discussed and a numerical example demonstrating the feasibility of the schemes and exhibiting their relative performance for purposes of comparison is provided. R.J.F.

N85-11380*# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
RELIABILITY CONSIDERATIONS FOR THE TOTAL STRAIN RANGE VERSION OF STRAINRANGE PARTITIONING Final Report
Paul H. Wirsching and Yih-Tsuen Wu Sep. 1984 85 p refs
(Grant NAG3-41)
(NASA-CR-174757; NAS 1.26:174757) Avail: NTIS HC A05/MF A01 CSCL 20K

A proposed total strainrange version of strainrange partitioning (SRP) to enhance the manner in which SRP is applied to life prediction is considered with emphasis on how advanced reliability technology can be applied to perform risk analysis and to derive safety check expressions. Uncertainties existing in the design factors associated with life prediction of a component which experiences the combined effects of creep and fatigue can be identified. Examples illustrate how reliability analyses of such a component can be performed when all design factors in the SRP model are random variables reflecting these uncertainties. The Rackwitz-Fiessler and Wu algorithms are used and estimates of the safety index and the probablity of failure are demonstrated for a SRP problem. Methods of analysis of creep-fatigue data with emphasis on procedures for producing synoptic statistics are presented. An attempt to demonstrate the importance of the contribution of the uncertainties associated with small sample sizes (fatique data) to risk estimates is discussed. The procedure for deriving a safety check expression for possible use in a design criteria document is presented. A.R.H.

N85-11381*# National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENT OF THE INERTIAL CONSTANTS OF A RIGID OR FLEXIBLE STRUCTURE OF ARBITRARY SHARE THROUGH A VIBRATION TEST
D. Engrand and J. Cortial Aug. 1983 23 p refs Transl. into ENGLISH from La Rech. Aerospatiale (France), no. 4, Jul. - Aug. 1970 p 213-219 Original language doc. previously announced in IAA as A70-41408 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-77557; NAS 1.15:77557) Avail: NTIS HC A02/MF A01 CSCL 20K

The inertial constants of an aircraft rocket, or of any other structure, are defined without materializing any rotating axis. The necessary equipment is very similar to that used normally for ground vibration tests. An elastic suspension is used to obtain the total natural modes corresponding to the motions of the structure as a solid. From the measurements of the generalized masses of these modes it is possible to compute the inertial constants: (1) center of inertia; (2) tensor of inertia; and (3) mass. When the structure is not strictly rigid a purification process, based on the mean square method makes it possible to rigidify it at the price of some approximations and a few more measurements. Eventual additional masses, that are not parts of the structure, can be taken into account. M.A.C.

N85-11382# State Univ. of New York, Buffalo. Buffalo Amherst Dept. of Mechanical and Aerospace Engineering.
QUALITATIVE RESULTS FOR DISTRIBUTED SYSTEMS WITH DISCRETE DAMPING AND STIFFNESS WITH APPLICATION TO CONTROL Interim Report, 1 Jul. 1983 - 30 Jun. 1984
D. J. Inman 20 Jul. 1984 9 p
(Grant AF-AFOSR-0242-82)
(AD-A145525; AFOSR-84-0724TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

Distributed parameter models of large flexible space structures subject to various control techniques have been studied. The main thrust has been to develop qualitative results which are independent of truncation or discretization approaches by treating the fully distributed model. Emphasis has been on controlling the transient response of non-conservative linear partial differential equation models of such structures subject to a few point actuators.
Author (GRA)

N85-11383# Ballistic Research Labs., Aberdeen Proving Ground, Md.

WEAK SHOCKS AND STEADY WAVES IN A NONLINEAR ELASTIC ROD OR GRANULAR MATERIAL Final Report
T. W. Wright Aug. 1984 33 p
(DA Proj. 1L1-61102-AH-43)
(AD-A145715; AD-F300462; ARBRL-TR-02584) Avail: NTIS HC A03/MF A01 CSCL 20/11

Theories for a nonlinear elastic rod and granular material are shown to be identical. Both cases admit shocks of two different types. Both also support steady waves, which may be either periodic or solitary waves. GRA

N85-11384# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
STRAIN DISTRIBUTION IN A TYPE 316/16-8-2 STAINLESS STEEL WELDMENT DURING CYCLIC LOADING
G. E. Korth and M. D. Harper 1984 7 p refs Presented at ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984
(Contract DE-AC07-76ID-01570)
(DE84-015644; EGG-M-17683; CONF-840647-26) Avail: NTIS HC A02/MF A01

Test specimens were cut from a 25 mm thick Type 316 stainless steel plate butt welded with 16-8-2 filler wire. The specimens were oriented transverse to the weld seam and contained base metal, heat affected zone (HAZ), and weld metal in the gage section. Strain controlled cyclic loading was imposed across the heterogeneous weldment while local strains at various points within the gage section were continuously monitored. It is shown that strains at the local points can vary markedly from the average strain of the composite section. Strain concentrations occurred in the softer base metal which led to failure much sooner than the composite strain would indicate. When the maximum strain range from a local area is compared to baseline data, the life correlation is very good. DOE

N85-11385# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
NEAR-THRESHOLD FATIGUE CRACK GROWTH AND CRACK CLOSURE IN 17-4 PRECIPITATION HARDENING STEEL AND 2043-T3 ALUMINUM ALLOY
Anders F. Blom Mar. 1984 20 p refs Presented at TMS-AIME/ASM Intern. Symp. on Fatigue Crack Growth Threshold Concepts, Philadelphia, 3-5 Oct. 1983
(Contract FMV-FlygFl-82223-80-001-21-001)
(FFA-TN-1984-16) Avail: NTIS HC A02/MF A01

Fatigue crack growth and crack closure experiments were performed on 17-4 precipitation hardening (PH) steel and on aluminum alloy 2024-T3, for stress ratios (R) ranging from - 1 to 0.75. Closure loads increase significantly when threshold conditions are approached. These high closure loads are explained in terms of a shear-mode type of crack growth and the formation of oxide debris at the crack tip. The crack growth is transgranular for Al 2024-T3 whereas for 17-4 PH steel crack growth is intergranular at low stress intensites but transgranular at higher delta K. When crack closure measurements are performed at higher delta K values, they correlate well with numerically computed values of the Elber type of plasticity-induced crack closure. At R = -1 lower thresholds are found than at small positive R values. This is explained by smoother crack surfaces due to the compressive loads and less roughness-induced crack closure. Author (ESA)

N85-11386# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
THE INFLUENCE OF SUBLAMINATE CRACKS ON THE TENSION FATIGUE BEHAVIOR OF A GRAPHITE EPOXY LAMINATE
Leif Carlsson, Curt Eidefeldt (Defense Material Administration, Stockholm), and Tommy Mohlin May 1984 36 p refs Presented at ASTM Symp. on Fatigue and Fracture of Composites, Dallas, Oct. 1984
(Contract FMV-FlygFl-82260-83-053-25-001)
(FFA-TN-1984-32) Avail: NTIS HC A03/MF A01

Quasi-isotropic 32-ply graphite epoxy specimens were tested in static tension and tension fatigue. Dry specimens and specimens containing 1% moisture (by weight) were tested. The first type of damage observed under static and cyclic loading is transverse matrix cracking in the 90 deg plies. Under continued static or cyclic loading the cracks propagate into neighboring -45 deg plies. No delamination is observed under static loading. In fatigue, matrix cracks act as delamination initiators, markedly reducing stiffness and residual strength. For specimens subjected to a tensile overload before fatigue cycling, delamination occurs earlier due to the formation of more transverse matrix cracks. Moisture increases the stress level at which first ply failure occurs and delays damage development during fatigue at low stress levels. Levelling-off of crack density at a constant level during fatigue loading supports models which predict a characteristic damage state, independent of load history, before laminate failure. Author (ESA)

N85-11387# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
SHORT CRACKS AND CRACK CLOSURE IN AL 2024-T3
D. K. Holm and A. F. Blom Jul. 1984 11 p refs Presented at 14th Intern. Council of Aeron. Sci. Congr., Toulouse, 9-14 Sep. 1984
(Contract FMV-FlygFl-82223-80-183-21-001)
(FFA-TN-1984-40) Avail: NTIS HC A02/MF A01

Short fatigue crack propagation at rates faster than corresponding long cracks at the same nominal driving force in aluminum alloy is shown to be partly due to plasticity-induced crack closure effects. The effective range of stress intensity factor at short crack lengths is greater than at long crack lengths and the crack propagates faster. The analysis is carried out by elastic-plastic finite element calculations for a growing fatigue crack.
Author (ESA)

N85-11680# Joint Publications Research Service, Arlington, Va.
SIMULATION OF VIBRATION PROCESSES IN DAMPED STRUCTURES WITH ALLOWANCE FOR TEMPERATURE-FREQUENCY CHARACTERISTICS OF VIBRATION ABSORBING MATERIALS Abstract Only
L. Ye. Buvaylo and A. V. Ionov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 12 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 18-22 Previously announced as N84-32046 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11731# Joint Publications Research Service, Arlington, Va.
MECHANISM OF BRITTLE HEAT FRACTURE OF INHOMOGENEOUS SOLIDS BY HIGH TEMPERATURE GAS JETS Abstract Only
A. P. Dimitiyev, S. A. Goncharov, and L. N. Germanovich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 110 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 2, Sep. 1983 p 358-361 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11732# Joint Publications Research Service, Arlington, Va.
QUANTUM CHARACTERISTICS OF KINETIC FRACTURING OF SOLIDS Abstract Only
R. L. Salganik, A. I. Slutsker, and Kh. Aydarov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 111 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1362-1366 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11754# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF PLANE POLARIZED WAVES BY NONCIRCULAR CYLINDRICAL CAVITY Abstract Only
V. I. Kolodiy and N. A. Shulga *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 33 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 19, no. 8, Aug. 1983

p 19-23 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11775# Joint Publications Research Service, Arlington, Va.
PLASTIC DEFORMATION AND MICROSTRUCTURAL TRANSFORMATIONS OF METALS UNDER SHOCK WAVES Abstract Only
P. V. Makarov, T. M. Platova, and V. A. Skripnyak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 90-91 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 123-126 Original language document was announced as A84-14821 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11779# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF LONGITUDINAL ELASTIC WAVES IN MULTILAYERED HALF-SPACE Abstract Only
M. B. Rasulov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 95-96 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR: Ser. Fiz.-Tekhn. i Mat. Nauk (Baku), v. 4, no. 2, Oct. - Dec. 1983 p 43-48 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11780# Joint Publications Research Service, Arlington, Va.
WEDGE WITH CRACK IN BIELASTIC MEDIUM Abstract Only
Yu. N. Gasanov and A. K. Mekhdiyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 96 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR: Ser. Fiz.-Tekhn. i Mat. Nauk (Baku), v. 4, no. 2, Oct. - Dec. 1983 p 53-58 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

42 GEOSCIENCES (GENERAL)

N85-11388# Council for Scientific and Industrial Research, Pretoria (South Africa). National Programme for Weather, Climate and Atmosphere Research.
SEMINAR ON PRINCIPAL COMPONENTS ANALYSIS IN THE ATMOSPHERIC AND EARTH SCIENCES
1983 196 p refs Seminar held in Pretoria, 7-8 Feb. 1983 (CSIR-S-334; ISBN-0-7988-2673-8) Avail: NTIS HC A09/MF A01

Principle component analysis; data matrix structure; applications of correspondence analysis to meteorological data; spatial relationships in stream flow; application of component analysis to LANDSAT MSS data; and reduction of spectral dimension of remotely sensed data were discussed. For individual titles, see N85-11389 through N85-11399.

N85-11389# South Africa Univ., Pretoria. Dept. of Statistics.
WHAT IS PRINCIPAL COMPONENTS ANALYSIS? c65
F. E. Steffens *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 3-16 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

The basic ideas behind principal components analysis are illustrated geometrically, and its relationship to the properties of ellipses pointed out. The concept of percentage of the variance explained by a principal component is discussed. Certain potential pitfalls and shortcomings of the technique are listed. Author

N85-11390# South Africa Univ., Pretoria.
PRINCIPAL COMPONENTS: A REVIEW c65
M. W. Browne *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 17-23 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

The main properties of principal components will be reviewed and the implications of these properties for the use of principal components analysis will be discussed. An attempt will be made to avoid an excessive use of mathematical notion but a few simple algebraic formulae will be unavoidable. These will in general be accompanied by verbal descriptions. Familiarity with multiple linear regression and multiple correlation will be assumed. Principal components analysis is a descriptive statistical procedure intended for use in situations where a moderately large number of observations were made on each of a substantial number of experimental units. The purpose of principal components analysis is purely exploratory. No statistical model is assumed and no attempt is made to investigate hypotheses. The aim is to discover trends or relationships and not to confirm or disprove preconceived ideas. While it is possible to consider principal components in some hypothetical infinite population our attention here is restricted to principal components based on a sample. B.G.

N85-11391# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE INFORMATION IN THE MINOR PRINCIPAL COMPONENTS c65
Douglas M. Hawkins and L. Paul Fatti *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 24-43 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

The minor principal components of a random vector x are the orthonormal linear combinations of the variables in x which have minimum variance. This fact may be used to detect interrelationships amongst the variables as well as to identify those variables which can be predicted with high accuracy from the others. Application of these ideas to the variable selection problem in multiple regression and to the identification of outliers in multivariate data are discussed. Author

N85-11392# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
DESCRIPTION OF A DATA MATRIX STRUCTURE AND MODEL DIAGNOSIS BY MEANS OF ROW AND COLUMN EUCLIDEAN MAPS c65
D. Bradu *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 44-59 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

A new graphical model diagnosis technique for two way tables is presented. This technique starts from the additive main effects and the multiplicative interaction effects estimates within a Multiplicative Interaction Model. The Row Euclidean and the Column Euclidean Map are the main elements of the method and represent displays of the rows and columns euclidean structure, with a graphical visualization of main effects and interaction; and a precise means of model diagnosis, following particular point configurations. An example from recent meteorological literature illustrates the technique. Author

N85-11393# South Africa Univ., Pretoria. Dept. of Statistics.
APPLICATION OF CORRESPONDENCE ANALYSIS TO METEOROLOGICAL DATA c47
Michael Greenacre and David Hudak (Water Research Commission) *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 60-74 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

Correspondence analysis is a multidimensional graphical technique which is described as a variant of principal components analysis. The leading case of a data set suitable for correspondence analysis is a two way contingency table. As a simple illustration a table which summarizes the association between daily rainfall and weather categorizations over three years in the region of the Bethlehem Weather Modification Experiment (BEWMEX) is analyzed. A much larger data set is then described, also emanating from BEWMEX, and correspondence analysis is used as a framework for automatically forecasting the daily weather type.

The pros and cons of this strategy, from both statistical and meteorological viewpoints, are discussed. Author

N85-11394# Witwatersrand Univ., Johannesburg (South Africa). Climatology Research Group.
THE IDENTIFICATION OF RAIN-BEARING SYNOPTIC SYSTEMS THROUGH PRINCIPAL COMPONENT ANALYSIS **c47**
M. S. J. Harrison *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 75-92 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

Principal components of monthly standardized rainfall data for 64 districts across South Africa for the period 1921 to 1977 are used to assist the identification of the major rain bearing synoptic systems. Identification is achieved by matching the spatial loading fields of the components with the spatial rainfall distribution associated with each system as revealed by satellite imagery. Consistent results are obtained for the summer months as a result of the quasi-consistent spatial distribution of rainfall associated with each system during that season. Identified systems include cloud bands linking the tropical and temperate circulations, coastal depressions, subtropical and tropical cyclones, cyclones on the west coast and troughs associated with cold fronts on the east coast of the subcontinent. Time series of rainfall from the cloud bands, generated from surface and satellite data, show close correspondence with the relevant time series generated by the principal component analysis. Author

N85-11395# Cansas International Corp. (Proprietary) Ltd. (South Africa).
A PRINCIPAL COMPONENT ANALYSIS OF EASTERN TRANSVAAL SEASONAL RAINFALL, 1950 TO 1981 **c47**
G. K. Mather *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 93-114 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

Many of the observations in a set of meteorological data are correlated. Daily, monthly and seasonal observations of 24 hour rainfall amounts are such examples. Others that come to mind are the common observations of temperatures and pressures. When faced with a large number of such variables it is often useful to transform the original set of variables into a new set of uncorrelated variables called principal components. These new variables are exact linear combinations of the original variables and are derived in decreasing order of importance, or explained variance. A study of these first few components may provide insights into the physical forcing functions which give rise to the observed distribution of the original variables. Another useful aspect of the Principal Component Analysis (PCA) is its ability to detect bad data. Often one of the components will single out stations or days on which erroneous data was collected or recorded. This use permits rapid editing of large data sets before commencing any analysis. B.G.

N85-11396# Orange Free State Univ., Bloemfontein (South Africa). Dept. of Agrometeorology.
THE APPLICATION OF PRINCIPAL COMPONENT ANALYSIS IN A STUDY OF RAINFALL **c47**
B. Kelbe *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 115-133 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

The general rainfall characteristics of the Eastern Transvaal are examined in relation to the topogaphical and latitudinal features of the region using Principal Component analysis. The dominating features of the rainfall are the spatial maximum precipitation along the Drakensburg escarpment and the strong annual cycle. These are clearly evident in the first Principal Component of the annual and monthly rainfall series. There is also evidence of a secular trend with quasi-periodicity of about 18 years. The analysis of monthly rainfall suggests additional shorter wavelength forcings of about 14 and 28 months. The second and third Principal Components of annual rainfall indicate low frequency oscillations which exhibit different phase relationships in the various geographical regions. These secular trends, however, are not apparent in the monthly series. The annual and semi-annual cycles dominating the second Principal Component of the monthly series produce a seasonality with a response function that is atrributed to topographical differences in the convective activity of the region. Author

N85-11397# Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
SPATIAL RELATIONSHIPS IN STREAM FLOW RESIDUALS **c43**
G. G. S. Pegram *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 134-155 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

An attempt is made to define precipitation and climatically dependent hydrologically homogeneous regions on a continent by component analysis. Using the input to the largest principle component (a linear combination of the recorded inputs) a serial correlation analysis is performed, and no evidence of pseudo-periodicity is found. Now rain-gauge data are notoriously noisy; on the other band, stream-gauge data tend to be inhomogeneous. However, a stream gauge records a spatially integrated filtered net input to a large area. A good data set of 50 or more annual gaugings for 40 years were recorded in the U.S.A. It is this set that is used for analysis. Author

N85-11398# National Physical Research Lab., Pretoria (South Africa).
THE APPLICATION OF PRINCIPAL COMPONENTS ANALYSIS TO LANDSAT MSS DATA **c43**
M. Lasserre, O. G. Malan, and B. Turner *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 156-168 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

The LANDSAT Multispectral Scanner (MSS) collects digital image data in four spectral bands. Only three of these can be displayed independently in image form in a three-dimensional colour space. Principal components analysis is therefore an obvious way of data reduction. The problems and possibilities of display of the original imagery and the principal components will be discussed with reference to practical applications. Author

N85-11399# Witwatersrand Univ., Johannesburg (South Africa). Centre for Resource Ecology.
REDUCING SPECTRAL DIMENSION OF REMOTELY SENSED DATA USING PRINCIPAL COMPONENTS ANALYSIS AND A PEANO SCANNING **c43**
Neil Pendock and Michael Sears *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 169-186 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

Remotely sensed data are collected in several spectral wavebands over a region. A digital picture of high spectral dimension is costly in terms of storage and computer processing, and is difficult to display. The aim of principal components analysis (the Karhunen-Loeve transformation) of a remotely sensed scene is to find a lower spectral dimensional representation that accounts for the feature variance. The Karhunen-Loeve transformation of an image is compared with another spectral dimension-reducing technique - an inverse space-filling (Peano) curve. A 4-band LANDSAT image is reduced to a black and white picture using the above techniques and is discussed. Author

N85-11400# Geological Survey, Washington, D.C.
MARINE GEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS OF THE ANTARCTIC CONTINENTAL MARGIN, 1984
Stephen L. Eittreim and Alan K. Cooper 1984 17 p refs
(GS-Circ-935; LC-84-601061) Avail: NTIS HC A02/MF A01

Geological investigations conducted adjacent to Wilkes Land and in the Ross Sea around Antarctica are summarized. The types of data collected are described and preliminary results are discussed. Instruments such as hydrophones, sonar, sonobuoys,

and magnetic sensors were utilized. One specific focus of study was the crustal structure of the Victoria Land basin and the Iselin Bank areas. R.S.F.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-11401 Indiana State Univ., Terre Haute.
THE FEASIBILITY OF SATELLITE REMOTE SENSING AS A TECHNIQUE FOR EVALUATING COAL MINE SURFACE FEATURES Ph.D. Thesis
Patrick James Madison 1984 133 p
Avail: Univ. Microfilms Order No. DA8416433

The potential for utilizing LANDSAT spectral signatures, instead of in-situ measurements, to determine values for various physical, chemical and biotic properties of coal mine surface features is discussed. The following five conclusions were derived: (1) a strong relationship was found between the measurements of the two data sets, with 94.7% of the variance between them accounted for by the first canonical variate; (2) statistically significant results were obtained using the spectral variables to predict relief, slope, vegetation type, vegetation density, parent material, surface temperature, moisture capacity, total organic carbon, and soil pH; (3) the distinct between class differences and minimal within class variations of the features studied resulted in only one significant spectral predictor of specific property values; (4) for minimally vegetated sites, the first principal component transformation (PC1) of the original LANDSAT data proved to be the best overall predictor; (5) prediction accuracy was increased substantially when categories were substituted for specific values of the criterion variables. In general, the study successfully demonstrated that LANDSAT spectral data could be used to predict statistically significant in situ measurements. Dissert. Abstr.

N85-11402 Oregon State Univ., Corvallis.
RELATIONSHIPS BETWEEN GRASS CANOPY CHARACTERISTICS AND LANDSAT THEMATIC MAPPER BANDS Ph.D. Thesis
William J. Ripple 1984 122 p
Avail: Univ. Microfilms Order No. DA8415292

The relationships between spectral reflectance in the LANDSAT Thematic Mapper (TM) bands and grass canopy variables were evaluated using in situ remote sensing techniques. Reflectance data were collected from experimental plots of annual ryegrass (Lolium multiflorum) and tall fescue (Festuca arundinacea) using a Barnes Modular Multiband Radiometer (MMR). The canopy variables used were canopy height, canopy cover, total wet biomass, total dry biomass, above-ground plant water, and leaf area index. Statistically significant relationships were found between the spectral bands and the canopy variables. Inverse relationships in the visible (TM1, TM2, TM3) and middle infrared (TM5, TM7) regions were related to spectral absorption by plant pigments (visible) and moisture within plant tissue (middle infrared). Direct relationships in the near infrared (TM4, MMR5) were attributed to enhanced reflectance resulting from spectral scattering. Overall, no one spectral band was found to be superior in all situations, but TM5 consistently showed the lowest correlations with the canopy variables. Dissert. Abstr.

N85-11403 Miami Univ., Coral Gables, Fla.
ACTIVE REMOTE SENSING OF OCEAN PARAMETERS, AN ENGINEERING STUDY Ph.D. Thesis
James Dennis Byrne 1984 137 p
Avail: Univ. Microfilms Order No. DA8418290

A study is made of a proposed method to measure the sound velocity, turbidity, and calculate the temperature as a function of depth in the ocean. A laser is used to generate a beam of light which is scattered by the sea. Brillouin scattering causes shifts of the wavelength of the incident laser light by an amount proportional to the sound velocity in the sea. Several instrumental designs for measuring this shift are considered. Fabry-Perot interferometers were chosen for use in prototype instruments. Initial laboratory experiments are described. A field experiment with a single Fabry-Perot used photographically and photoelectrically is described. The performance of this system as a temperature transducer was tested in the laboratory. Using ten second observations, temperature was measured with an rms estimate of error of 0.4 C in fresh water. Sound velocity measurement accuracy is estimated at better than 0.1% m/sec over the range of temperatures which were measured. Using modern interferometers and a more powerful laser, this result could be greatly improved. Dissert. Abstr.

N85-11404*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MULTISPECTRAL IMAGING SCIENCE WORKING GROUPS. VOLUME 1: EXECUTIVE SUMMARY Final Report
Scott C. Cox, ed. Washington 1 Sep. 1982 39 p Working groups held in Pasadena, Calif., San Antonio, and Silver Spring, Md., 1 Sep. 1982 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS 3 Vol.
(E85-10001; NASA-CP-2260-Vol-1; NAS 1.55:2260-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 05B

Results of the deliberations of the six multispectral imaging science working groups (Botany, Geography, Geology, Hydrology, Imaging Science and Information Science) are summarized. Consideration was given to documenting the current state of knowledge in terrestrial remote sensing without the constraints of preconceived concepts such as possible band widths, number of bands, and radiometric or spatial resolutions of present or future systems. The findings of each working group included a discussion of desired capabilities and critical developmental issues. M.G.

N85-11405*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPECTRAL IMAGING SCIENCE WORKING GROUP. VOLUME 2: WORKING GROUP REPORTS Final Report
Scott C. Cox, ed. Washington 1 Sep. 1982 336 p refs Meetings held in Pasadena, Calif., San Antonio, and Silver Spring, Md., 1982 Original contains imagery. Original photography may be purchased from EROS Data Center, Sioux Falls, S.D. 57198 ERTS 3 Vol.
(E85-10002; NASA-CP-2260-Vol-2; NAS 1.55:2260-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 05B

Summaries of the various multispectral imaging science working groups are presented. Current knowledge of the spectral and spatial characteristics of the Earth's surface is outlined and the present and future capabilities of multispectral imaging systems are discussed. For individual titles, see N85-11406 through N85-11415.

N85-11406*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMAGING SCIENCE PANEL. MULTISPECTRAL IMAGING SCIENCE WORKING GROUP JOINT MEETING WITH INFORMATION SCIENCE PANEL: INTRODUCTION Final Report
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 33-60 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The state-of-the-art of multispectral sensing is reviewed and recommendations for future research and development are proposed. specifically, two generic sensor concepts were discussed. One is the multispectral pushbroom sensor utilizing linear array technology which operates in six spectral bands including two in the SWIR region and incorporates capabilities for stereo and crosstrack pointing. The second concept is the imaging spectrometer (IS) which incorporates a dispersive element and area arrays to provide both spectral and spatial information

simultaneously. Other key technology areas included very large scale integration and the computer aided design of these devices. M.G.

N85-11407*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BOTANICAL SCIENCES TEAM Final Report
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 63-104 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

Improvements in vegetation monitoring and mapping which would result from increased spectral and spatial resolution in multispectral systems are discussed. Current knowledge of the spectral properties of vegetation is reviewed and areas where existing knowledge is incomplete are identified. In addition, the effects of the atmosphere on the remote sensing of vegetation are examined. M.G.

N85-11408*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOGRAPHIC SCIENCE: EXECUTIVE SUMMARY Final Report
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 105-114 ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The role that TM and MSS data play in the analysis of spatial patterns for land use/land cover, geomorphology studies, and the development of cartographic products is discussed. Tables listing geographic science data gaps, mission data requirements, and possible future remote sensing missions are included. M.A.C.

N85-11409*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOGRAPHIC SCIENCE
N. Bryant *In its* The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 115-117 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The use of multispectral imaging systems in land use, geomorphological, and cartographic applications is examined. Spatial, spectral, and geometric resolution requirements for photo interpretation and multispectral pattern recognition are discussed. The potential contributions of these systems in specific experiments is also included. M.A.C.

N85-11410*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAND USE/LAND COVER
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 119-150 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The use of remote sensing multispectral systems in urban/suburban land use, and environmental impact from surface mines is discussed. The classification system used in conjunction with the land use/land cover data is included. M.A.C.

N85-11411*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOMORPHOLOGY
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 157-180 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The study of geomorphology and terrain analysis using TM and MSS data are discussed. The spatial and spectral characteristics of a variety of landforms are also investigated. An outline of possible experiments and a summary of data requirements are included. M.A.C.

N85-11412*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CARTOGRAPHY Final Report
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 181-206 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The demand for cartographic products at scales of 1:25,000 to 1:250,000 continues to increase throughout the world in order to meet requirements associated with: the survey and management of natural resources; environmental planning; and the establishment of geo-referenced data bases. A satellite system involving the use of multispectral linear array (MLA) sensors designed to meet cartographic requirements in terms of the completeness of detail and geometric accuracy standards associated with mapping programs offers great promise for rapidly providing the data with which to produce four types of map products/and data. These include topographic maps; digital terrain information (x,y,z coordinates; thematic mapping; and image maps. Each type of cartographic product/data is briefly considered in relation to current needs. B.G.

N85-11413*# National Aeronautics and Space Administration, Washington, D. C.
WORKSHOP ON THE USE OF FUTURE MULTISPECTRAL IMAGING CAPABILITIES FOR LITHOLOGIC MAPPING: WORKSHOP SUMMARY Final Report
Mark Settle and John Adams (Washington Univ., Seattle) *In* NASA. Goddard Space Flight Center The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 207-228 ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

Improved orbital imaging capabilities from the standpoint of different scientific disciplines, such as geology, botany, hydrology, and geography were evaluated. A discussion on how geologists might exploit the anticipated measurement capabilities of future orbital imaging systems to discriminate and characterize different types of geologic materials exposed at the Earth's surface is presented. Principle objectives are to summarize past accomplishments in the use of multispectral imaging techniques for lithologic mapping; to identify critical gaps in earlier research efforts that currently limit the ability to extract useful information about the physical and chemical characteristics of geological materials from orbital multispectral surveys; and to define major thresholds, resolution and sensitivity within the visible and infrared portions of the electromagnetic spectrum which, if achieved would result in significant improvement in our ability to discriminate and characterize different geological materials exposed at the Earth's surface. B.G.

N85-11414*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTISPECTRAL IMAGING SCIENCE WORKING GROUP FOR HYDROLOGIC SCIENCE: EXECUTIVE SUMMARY Final Report
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 229-264 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The following working objectives were adopted: (1) define the current state of knowledge concerning the role of multispectral imaging science in hydrology; (2) identify critical areas where gaps in our knowledge limit opportunities for significant improvements in our understanding of the hydrologic processes; (3) evaluate the potential of multispectral imaging sciences as tools to close these gaps in knowledge; and (4) develop guidelines for a series of remote-sensing-based experiments that would help close these gaps in knowledge and, thereby, provide man with the improved scientific base necessary for better utilization of the world's water resource. The resulting documentation is intended to provide guidance for multispectral imaging programs in the hydrologic sciences with special emphasis on the visible and infrared (IR) wavelengths. Author

N85-11415*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFORMATION SCIENCE PANEL JOINT MEETING WITH IMAGING SCIENCE PANEL Final Report
In its The Spectral Imaging Sci. Working Group, Vol. 2 7 Sep. 1982 p 265-299 refs ERTS (For primary document see N85-11405 02-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

Specific activity in information extraction science (taken to include data handling) is needed to: help identify the bounds of practical missions; identify potential data handling and analysis scenarios; identify the required enabling technology; and identify the requirements for a design data base to be used by the disciplines in determining potential parameters for future missions. It was defined that specific analysis topics were a function of the discipline involved, and therefore no attempt was made to define any specific analysis developments required. Rather, it was recognized that a number of generic data handling requirements exist whose solutions cannot be typically supported by the disciplines. The areas of concern were therefore defined as: data handling aspects of system design considerations; enabling technology for data handling, with specific attention to rectification and registration; and enabling technology for analysis. Within each of these areas, the following topics were addressed: state of the art (current status and contributing factors); critical issues; and recommendations for research and/or development. B.G.

N85-11416*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A PROSPECTUS FOR THEMATIC MAPPER RESEARCH IN THE EARTH SCIENCES
Jul. 1984 71 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E85-10003; NASA-TM-86149; NAS 1.15:86149) Avail: NTIS HC A04/MF A01 CSCL 08B

Earth science applications of Thematic Mapper (TM) imagery are discussed. Prospective research themes are defined in a general sense in relation to the technical measurement capabilities of the TM and the various types of Earth information that can potentially be derived from multispectral TM imagery. An overview of the system developed to acquire and reduce TM data is presented. The technical capabilities of this system are presented in detail. The orbital performance of the TM sensor is described, based upon the analysis of LANDSAT 4 and 5 TM data collected to date. M.A.C.

N85-11417*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FUNDAMENTAL REMOTE SENSING SCIENCE RESEARCH PROGRAM. PART 1: STATUS REPORT OF THE MATHEMATICAL PATTERN RECOGNITION AND IMAGE ANALYSIS PROJECT
Richard D. Heydorn Aug. 1984 44 p ERTS 2 Vol.
(E85-10004; NASA-TM-58260-Pt-1; S-536-Pt-1; NAS 1.15:58260-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 05B

The Mathematical Pattern Recognition and Image Analysis (MPRIA) Project is concerned with basic research problems related to the study of the Earth from remotely sensed measurement of its surface characteristics. The program goal is to better understand how to analyze the digital image that represents the spatial, spectral, and temporal arrangement of these measurements for purposing of making selected inference about the Earth. Author

N85-11418*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A PRELIMINARY STUDY OF THE FEASIBILITY OF DETECTING THE FLOATING MACROPHYTES BY MEANS OF DIGITAL PROCESSING OF MSS/LANDSAT DATA [ESTUDO PRELIMINAR SOBRE A VIABILIDADE DE DETECCAO DE MACROFITAS FLUTUANTES ATRAVES DE PROCESSAMENTO DIGITAL DE DADOS DO MSS/LANDSAT]
Dalton deMorisson Valeriano, Principal Investigator Aug. 1984 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 3rd Simp. Brasileiro de Sensoriamento Remoto, Rio de Janeiro, 28-30 Nov. 1984 Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E85-10005; NASA-CR-174031; NAS 1.26:174031; INPE-3228-PRE/579) Avail: NTIS HC A02/MF A01 CSCL 05B

The feasibility of mapping the floating macrophytes (mostly water hyacinth: (Eichornia crassipes) in the Salto Grande reservoir in Americana, SP, by means of digital processing of MSS/LANDSAT data is described. The area occupied by the macrophytes was extracted by exclusion after the merging of two thematic masks representing the area of vegetation free water surface. One of the masks was obtained from a date when the vegetal cover is insignificant, while the other represents a large infestation episode. The utilization of digital processing of MSS/LANDSAT data techniques for the documentation of macrophytes infestation is feasible only when the phenomenon occurs in large areas. Author

N85-11419*# Aster Consulting Associates, Binghamton, N.Y.
BIOPHYSICAL AND SPECTRAL MODELING FOR CROP IDENTIFICATION AND ASSESSMENT Final Report
Narendra S. Goel, Principal Investigator 15 Sep. 1984 31 p ERTS
(Contract NAS9-16873)
(E85-10006; NASA-CR-171813; NAS 1.26:171813) Avail: NTIS HC A03/MF A01 CSCL 02C

The development of a technique for estimating all canopy parameters occurring in a canopy reflectance model from the measured canopy reflectance data is summarized. The Suits and the SAIL model for a uniform and homogeneous crop canopy were used to determine if the leaf area index and the leaf angle distribution could be estimated. Optimal solar/view angles for measuring CR were also investigated. The use of CR in many wavelengths or spectral bands and of linear and nonlinear transforms of CRs for various solar/view angles and various spectral bands is discussed as well as the inversion of radiance data inside the canopy, angle transforms for filtering out terrain slope effects, and modification of one dimensional models. A.R.H.

N85-11420*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
HYPOTHESIS ON THE ORIGIN OF LINEAMENTS IN THE LANDSAT AND SLAR IMAGES OF PRECAMBRIAN SOIL IN THE LOW CONTAS RIVER VALLEY (SOUTHERN BAHIA) [UMA HIPOTESE SOBRE A ORIGEM DOS LINEAMENTOS DAS IMAGENS LANDSAT E SLAR NOW TERRENOS PRE-CAMBRIANOS DO BAIXO VALE DO RIO DE CONTAS (SUL DA BAHIA)]
Chan Chiang Liu, Principal Investigator and Jose Eduardo Rodrigues Sep. 1984 26 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E85-10007; NASA-CR-168559; NAS 1.26:168559; INPE-3287-RPE/467) Avail: NTIS HC A03/MF A01 CSCL 05B

Examination of LANDSAT and SLAR images in southern Bahia reveals numerous linear features, which are grouped in five sets, based on their trends: N65 degrees E, N70 degrees W, N45 degrees E and NS/N15 degrees E. Owing to their topographic expressions, distribution patterns, spacing between individual lineaments and their mutual relationships, the lineament sets of N65 degrees E and N70 degrees W, as well as the sets of N40 degrees E and N45 degrees W, are considered as two groups of conjugate shear fractures and the former is older and is always cut by the latter. Their conjugate shear angles are 45 degrees and 85 degrees and their bisector lines are approximately in east-west and north-south directions, respectively. According to Badgeley's argumentation on the conjugate shear angles, the former conjugate shear fractures would be caused by: (1) vertical movements, and the bisector of their conjugate angle would be parallel to the long axis of horsting or folding, or (2) by a compressive force in the east-west direction and under a condition of low confining pressure and temperature. Author

N85-11421*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYSTEMATIC DATA INTERPRETATION OF REMOTE SENSING IN THE RECEPTION OF HYDROCARBONS, VOLUME 1 M.S. Thesis [SISTEMATICA DE INTERPRETACAO DE DADOS DE SENSORIAMENTO REMOTO NA RECEPCAO DE HIDROCARBONETOS, VOLUME 1]
Fernando Pellon deMiranda, Principal Investigator Apr. 1984 177 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS 2 Vol.
(E85-10008; NASA-CR-168560; NAS 1.26:168560; INPE-3087-TDL/162-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 05B

The utilization of MSS-LANDSAT and RADAR imagery in the definition of morphostructural anomalies, which are indicative of hydrocarbon entrapment sites in the limit of the Middle and Lower Amazons basins was systemized. The identification and classification of the morphostructural anomalies were accomplished by means of the drainage network interpretation, based on the criteria previously proposed. Thirty anomalies were recognized, being subdivided into twenty domes, two fault controlled domes, six structural depressions, one fault controlled structural depression and one structure developed on a tilted fault block. Many anomalies are not randomly located. Rather, they seem to be aligned according to directions ENE and NNW, suggesting the presence of morphstructural trends in this part of the Amazons Basin. Significant orientations of lineaments were determined through statistical analysis, which defined many regional trends. The directions coincide with morphostructural trends orientations and with the directions of important structures in the Precambrian basement. Author

N85-11422*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
UTILIZATION OF LANDSAT ORBITAL IMAGERY IN THE SOIL SURVEY PROCESSES AT RIO GRANDE DO NORTE STATE [UTILIZACAO DE IMAGENS ORBITAIS LANDSAT PARA LEVANTAMENTO DE SOLOS NO ESTADO DO RIO GRANDE DO NORTE]
Antonio Roberto Formaggio, Principal Investigator Sep. 1984 28 p In PORTUGUESE; ENGLISH summary Presented at GEOTEC 1, Rio de Janeiro, Nov. 1983 Sponsored by NASA ERTS
(E85-10009; NASA-CR-168566; NAS 1.26:168566; INPE-3270-RPE/465) Avail: NTIS HC A03/MF A01 CSCL 05B

Pedologic photointerpretative criteria adapted to LANDSAT orbital imagery were used: drainage (pattern, integration degree, density and uniformity degree); relief (pattern, dissection degree and crest lines); photographic texture, photographic tonnality, and the land use (type, glebas size and intensity of use). The performance of the imagery as an auxiliar tool in the soil survey processes, at Rio Grande do Norte State was evaluated. The drainage and relief elements were easily extracted from the imagery and also ones that provided the greatest deductive possibility about pedologic boundaries. Other analyzed criteria were considered only auxiliaries, corroborating some soil limits in the evidences convergence phase. The principal pedologic dominions of the 30,000 sq km are covered by the same LANDSAT image (WRS 359/16) were delimited with good precision: (1) fluvial plains, beaches, dunes and coastal mangroves; (2) North Coast line Plateau; (3) Acu Sandstone Zone; (4) residual plateaus of the Tertiary; and (6) plains of the embasement. Author

N85-11423*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING AS A MINERAL PROSPECTING TECHNIQUE [SENSORIAMENTO REMOTO COMO TECNICA DE PROSPECCAO MINERAL]
Paulo Roberto Meneses, Principal Investigator Apr. 1984 20 p refs In PORTUGUESE; ENGLISH summary Presented at the Simposio Brasil. de Tec. Exploratorias Apl. a Geologia, Salvador, Brazil, 18-21 Mar. 1984 Sponsored by NASA ERTS
(E85-10010; NASA-CR-168567; NAS 1.26:168567; INPE-3051-PRE/472) Avail: NTIS HC A02/MF A01 CSCL 08B

Remote sensing and its application as an alternative technique to mineral resource exploration are reviewed. Emphasis is given here to the analysis of the three basic attributes of remote sensing, i.e., spatial attributes related to regional structural mapping, spectral attributes related to rock discrimination and seasonal attributes related to geobotanic anomalies mapping, all of which are employed in mineral exploration. Special emphasis is given to new developments of the Thematic Mapper of the LANDSAT-5, principally with reference to the application of the bands 1.6 and 2.2 microns to map hydrothermally altered rocks and the band of red and blue shift to geobotanical anomalies mapping. Author

N85-11424*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EXECUTIVE REPORT: RESULTS OF THE IRGA-CNPq/INPE EXPERIMENTAL PROJECT [RELATORIO EXECUTIVO: RESULTADOS DO PROJETO EXPERIMENTAL IRGA-CNPQ/INPE]
Getulio Vargas deAssuncao, Principal Investigator, Rene Antonio Novaes, and Mauricio Alves Moreira Oct. 1983 70 p In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E85-10011; NASA-CR-168568; NAS 1.26:168568; INPE-2939-RPE/446) Avail: NTIS HC A04/MF A01 CSCL 02F

A methodology for identifying and evaluating crop area with irrigated rice is described, using MSS-LANDSAT data. The maps of the spatial rice crop areas in the studied region are presented. The calculation of rice growing area from the LANDSAT images are included. M.A.C.

N85-11425*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING APPLIED TO FOREST RESOURCES [SENSORES REMOTOS EM LEVANTAMENTOS FLORESTAIS]
Pedro HernandezFilho, Principal Investigator Jul. 1984 27 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Simposio sobre Inventario Florestal, Piracicaba, Brazil, 15-16 Aug. 1984 Sponsored by NASA ERTS
(E85-10012; NASA-CR-168569; NAS 1.26:168569; INPE-3167-PRE/537) Avail: NTIS HC A03/MF A01

The development of methodologies to classify reforested areas using remotely sensed data is discussed. A preliminary study was carried out in northeast of the Sao Paulo State in 1978. The reforested areas of Pinus spp and Eucalyptus spp were based on the spectral, spatial and temporal characteristics fo LANDSAT imagery. Afterwards, a more detailed study was carried out in the Mato Grosso do Sul State. The reforested areas were mapped in functions of the age (from: 0 to 1 year, 1 to 2 years, 2 to 3 years, 3 to 4 years, 4 to 5 years and 5 to 6 years) and of the heterogeneity stand (from: 0 to 20%, 20 to 40%, 40 to 60%, 60 to 80% and 80 to 100%). The relative differences between the artificial forest areas, estimated from LANDSAT data and ground information, varied from -8.72 to +9.49%. The estimation of forest volume through a multistage sampling technique, with probability proportional to size, is also discussed. M.A.C.

N85-11426*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A REPORT ON THE TRAINING COURSE AT FORTALEZA (CEARA) [RELATORIO DO CURSO DE TREINAMENTO DE FORTALEZA (CEARA)]
Marx Prestes Barbosa, Principal Investigator Dec. 1983 28 p In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E85-10013; NASA-CR-168570; NAS 1.26:168570; INPE-2989-RPE/453) Avail: NTIS HC A03/MF A01 CSCL 05B

The activities of the on the job training course Applications of the Remote Sensing Data, with Emphasis on LANDSAT Images, to Study the Natural Resources are described. M.A.C.

N85-11427*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SYSTEM FOR THE MANAGEMENT OF REQUESTS AT AN

IMAGE DATA BANK M.S. Thesis [UM SISTEMA PARA GERENCIAMENTO DO ATENDIMENTO DE PEDIDOS A UM BANCO DE IMAGENS]

Jose Luiz deBarrosAguirre, Principal Investigator Jun. 1984 157 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E85-10014; NASA-CR-168571; NAS 1.26:168571; INPE-3151-TDL/168) Avail: NTIS HC A08/MF A01 CSCL 05B

An automated system was implemented to supersede existing manual procedures in fulfilling user requests made to a remote sensing data bank, concerning specifically LANDSAT imagery. The system controls the several production steps from request entry to the shipment of each final product. Special solutions and techniques were employed due to the severe limitations, in both hardware and software of the host minicomputer system. Author

N85-11428*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

WATER RESOURCES BY ORBITAL REMOTE SENSING: EXAMPLES OF APPLICATIONS [RECURSOS HIDRICOS POR SENSORIAMENTO REMOTO ORBITAL: EXEMPLOS DE APLICACOES]

Paulo Roberto Martini, Principal Investigator Jun. 1984 36 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E85-10015; NASA-CR-168572; NAS 1.26:168572; INPE-3157-RPE/457) Avail: NTIS HC A03/MF A01 CSCL 05B

Selected applications of orbital remote sensing to water resources undertaken by INPE are described. General specifications of Earth application satellites and technical characteristics of LANDSAT 1, 2, 3, and 4 subsystems are described. Spatial, temporal and spectral image attributes of water as well as methods of image analysis for applications to water resources are discussed. Selected examples are referred to flood monitoring, analysis of water suspended sediments, spatial distribution of pollutants, inventory of surface water bodies and mapping of alluvial aquifers. Author

N85-11429*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

BASIC PRINCIPLES, METHODOLOGY, AND APPLICATIONS OF REMOTE SENSING IN AGRICULTURE [PRINCIPIOS BASICOS, METODOLOGIAS E APLICACOES DE SENSORIAMENTO REMOTO NA AGRICULTURA]

Mauricio Alves Moreira, Principal Investigator and Getulio Vargas deAssuncao Jul. 1984 70 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E85-10016; NASA-CR-168573; NAS 1.26:168573; INPE-3199-MD/027) Avail: NTIS HC A04/MF A01 CSCL 02C

The basic principles of remote sensing applied to agriculture and the methods used in data analysis are described. Emphasis is placed on the importance of developing a methodology that may help crop forecast, basic concepts of spectral signatures of vegetation, the methodology of the LANDSAT data utilization in agriculture, and the remote sensing program application of INPE (Institute for Space Research) in agriculture. M.A.C.

N85-11430*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MAPPING LAND USE CHANGES IN THE CARBONIFEROUS REGION OF SANTA CATARINA, REPORT 2 [MAPEAMENTO DA ALTERACAO DO USO DO SOLO NA REGIAO CARBONIFERA DE SANTA CATARINA - RELATORIO 2]

Dalton deMorrison Valeriano, Principal Investigator and Maris Dantas BitencourtPereira Nov. 1983 35 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E85-10017; NASA-CR-168574; NAS 1.26:168574; INPE-2945-RPE/447) Avail: NTIS HC A03/MF A01 CSCL 08B

The techniques applied to MSS-LANDSAT data in the land-use mapping of Criciuma region (Santa Catarina state, Brazil) are presented along with the results of a classification accuracy estimate tested on the resulting map. The MSS-LANDSAT data digital processing involves noise suppression, features selection and a hybrid classifier. The accuracy test is made through comparisons with aerial photographs of sampled points. The utilization of digital processing to map the classes agricultural lands, forest lands and urban areas is recommended, while the coal refuse areas should be mapped visually. Author

N85-11431*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DEVELOPMENT AND TESTING OF A RURAL CREDIT SUPERVISION SYSTEM AT THE LEVEL OF COUNTIES AND RURAL PROPERTIES UTILIZING REMOTE SENSING TECHNIQES [DESENVOLVIMENTO E TESTE DE UM SISTEMA DE FISCALIZACAO DAS OPERACOES DE CREDITO AGRICOLA AO NIVEL DE MUNICIPIO E DE PROPRIEDADES AGRICOLAS UTILIZANDO TECNICAS DE SENSORIAMENTO REMOTO]

Getulio Teixeira Batista, Principal Investigator, Angela Maria deLima, Antonio Tebaldi Tardin, Bernardo Friedrich Theodor Rudorff, Franciso Jose Mendonca, Sergio dosAnjosFerreiraPinto, Sherry Chou Chen, and Valdete Duarte Aug. 1984 116 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E85-10018; NASA-CR-168575; NAS 1.26:168575; INPE-3239-RPE/462) Avail: NTIS HC A06/MF A01 CSCL 05B

Remote sensing techniques for supporting the rural credit supervision system were developed and tested. The test area comprised the counties of Aracatuba and Guararapes, located in the State of Sao Paulo. Aerial photography, LANDSAT images and topographic charts were used. Aerial photographs were extremely useful for the out lining of properties boundaries with financing of sugarcane plantations by the Banco do Brasil S.A.. The percentage of correctly interpreted sugarcane on LANDSAT images, considering the 85 analyzed properties, was of 63.12%. The occurrence of atypical conditions such as excessive raining, sugarcane in bloom, and wind damaged sugarcane and sugarcane not harvested due to planning failures verified during the period the images were obtained, were some of the contributing factors associated with a low interpretation performance. An alternative approach was developed using several LANDSAT overpasses and auxiliary field data, which resulted in 91.77 percent correct. Author

N85-11432*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

ACTIVE MICROWAVE MEASUREMENTS OF SEA ICE UNDER FALL CONDITIONS: THE RADARSAT/FIREX FALL EXPERIMENT

R. G. Onstott, Y. S. Kim, and R. K. Moore Jun. 1984 100 p refs Sponsored in part by Atmospheric Environment Service of Canada ERTS

(Grant NAGw-334; Contract N00014-76-C-1105) (E85-10019; NASA-CR-168576; NAS 1.26:168576; RSL-TR-331-30/578-Final) Avail: NTIS HC A05/MF A01 CSCL 08L

A series of measurements of the active microwave properties of sea ice under fall growing conditions was conducted. Ice in the inland waters of Mould Bay, Crozier Channel, and Intrepid inlet and ice in the Arctic Ocean near Hardinge Bay was investigated. Active microwave data were acquired using a helicopter borne scatterometer. Results show that multiyear ice frozen in grey or first year ice is easily detected under cold fall conditions. Multiyear ice returns were dynamic due to response to two of its scene constituents. Floe boundaries between thick and thin ice are well defined. Multiyear pressure ridge returns are similar in level to background ice returns. Backscatter from homogeneous first year ice is seen to be primarily due to surface scattering. Operation at 9.6 GHz is more sensitive to the detailed changes in scene roughness, while operation at 5.6 GHz seems to track roughness changes less ably. R.S.F.

N85-11433*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON GRAVITY FROM SST, GEOID FROM SEASAT, AND PLATE AGE AND FRACTURE ZONES IN THE PACIFIC
B. D. Marsh (Johns Hopkins Univ., Baltimore), J. G. Marsh, and R. G. Williamson, Principal Investigators (EG and G Washington Analytical Services Center, Inc., Riverdale, Md.) [1984] 39 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NAG5-32)
(E85-10020; NASA-TM-87387; NAS 1.15:87387) Avail: NTIS HC A03/MF A01 CSCL 08E

A composite map produced by combining 90 passes of SST data show good agreement with conventional GEM models. The SEASAT altimeter data were deduced and found to agree with both the SST and GEM fields. The maps are dominated (especially in the east) by a pattern of roughly east-west anomalies with a transverse wavelength of about 2000 km. Comparison with regional bathymetric data shows a remarkedly close correlation with plate age. Most anomalies in the east half of the Pacific could be partly caused by regional differences in plate age. The amplitude of these geoid or gravity anomalies caused by age differences should decrease with absolute plate age, and large anomalies (approximately 3 m) over old, smooth sea floor may indicate a further deeper source within or perhaps below the lithosphere. The possible plume size and ascent velocity necessary to supply deep mantle material to the upper mantle without complete thermal equilibration was considered. A plume emanating from a buoyant layer 100 km thick and 10,000 times less viscous than the surrounding mantle should have a diameter of about 400 km and must ascend at about 10 cm/yr to arrive still anomalously hot in the uppermost mantle. A.R.H.

N85-11434*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY ON SPECTRAL/RADIOMETRIC CHARACTERISTICS OF THE THEMATIC MAPPER FOR LAND USE APPLICATIONS Quarterly Status Technical Progress Report, 21 Mar. - 20 Jun. 1984
William A. Malila, Principal Investigator and Michael D. Metzler Aug. 1984 25 p ref ERTS
(Contract NAS5-27346)
(E85-10021; NASA-CR-174044; NAS 1.26:174044; ERIM-164000-11-P; QSTPR-7) Avail: NTIS HC A02/MF A01 CSCL 08B

Progress under the LANDSAT-4 and 5 Image Data Quality Assessment program for the Thematic Mapper is described. An initial screening of LANDSAT-5 data is performed. Tools are developed to allow access to TIPS-format data. Analysis of scan direction related signal droop is resumed with detailed analysis of nighttime data. A new mathematical model is developed to describe the effect. Coherent noise of a lower frequency than previously reported is discovered and analyzed. Coincident LANDSAT-4 TM and MSS data are analyzed to improve understanding of radiometric relationships between similar wavebands in the two sensors. M.A.C.

N85-11435*# Mississippi State Univ., Mississippi State. Remote Sensing Center.
REMOTE SENSING APPLICATIONS PROGRAM Summary Report, Nov. 1973 - Oct. 1984
Nov. 1984 36 p ERTS
(Grant NGL-25-001-054)
(E85-10022; NASA-CR-174045; NAS 1.26:174045) Avail: NTIS HC A03/MF A01 CSCL 05B

The activities of the Mississippi Remote Sensing Center are described in addition to technology transfer and information dissemination, remote sensing topics such as timber identification, water quality, flood prevention, land use, erosion control, animal habitats, and environmental impact studies are also discussed. M.A.C.

N85-11436*# Kansas Univ., Lawrence. Space Technology Center.
THE APPLICATION OF REMOTE SENSING TO RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY PROGRAMS IN KANSAS Annual Report, 1 Apr. 1982 - 31 Mar. 1983
B. G. Barr and E. A. Martinko, Principal Investigators Dec. 1983 209 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NGL-17-004-024)
(E85-10023; NASA-CR-174046; NAS 1.26:174046) Avail: NTIS HC A10/MF A01 CSCL 13B

The activities of the Kansas Applied Remote Sensing (KARS) Program during the period April 1, 1982 through Marsh 31, 1983 are described. The most important work revolved around the Kansas Interagency Task Force on Applied Remote Sensing and its efforts to establish an operational service oriented remote sensing program in Kansas state government. Concomitant with this work was the upgrading of KARS capabilities to process data for state agencies through the vehicle of a low cost digital data processing system. The KARS Program continued to take an active role in irrigation mapping. KARS is now integrating data acquired through analysis of LANDSAT into geographic information systems designed for evaluating groundwater resources. KARS also continues to work at the national level on the national inventory of state natural resources information systems. R.S.F.

N85-11437*# Columbia Univ., New York. Dept. of Geography.
APPLICATION OF DIGITAL ANALYSIS OF MSS TO AGRO-ENVIRONMENTAL STUDIES Final Technical Report
S. N. Goward and R. A. Lewis, Principal Investigators 30 Sep. 1983 4 p ERTS
(Contract NCC5-20)
(E85-10024; NASA-CR-174047; NAS 1.26:174047) Avail: NTIS HC A02/MF A01 CSCL 05B

Topics of investigation include infrared analysis of vegetation canopies, urban/rural albedo studies, analysis of Field Spectrometer System (ESS) observations, geometric and radiometric processing techniques of aircraft MSS data, and the use of LANDSAT MSS observations to map wetlands and snow cover. M.A.C.

N85-11438*# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
THE SOUTH-CENTRAL UNITED STATES MAGNETIC ANOMALY Final Report
William J. Hinze, Lawrence W. Braile, Principal Investigators, and Patrick J. Starich Jun. 1984 86 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NAG5-231)
(E85-10025; NASA-CR-174048; NAS 1.26:174048) Avail: NTIS HC A05/MF A01 CSCL 08G

The South-Central United States Magnetic Anomaly is the most prominent positive feature in the MAGSAT scalar magnetic field over North America. The anomaly correlates with increased crustal thickness, above average crustal velocity, negative free air gravity anomalies and an extensive zone of Middle Proterozoic anorogenic felsic basement rocks. Spherical dipole source inversion of the MAGSAT scalar data and subsequent calculation of reduced to pole and derivative maps provide constraints for a crustal magnetic model which corresponds geographically to the extensive Middle Proterozoic felsic rocks trending northeasterly across the United States. These felsic rocks contain insufficient magnetization or volume to produce the anomaly, but are rather indicative of a crustal zone which was disturbed during a Middle Proterozoic thermal event which enriched magnetic material deep in the crust. M.G.

N85-11439*# Arizona Univ., Tucson. Optical Sciences Center.
SPECTRORADIOMETRIC CALIBRATION OF THE THEMATIC MAPPER AND MULTISPECTRAL SCANNER SYSTEM Quarterly Report, 1 May - 1 Aug. 1984
Philip N. Slater and James M. Palmer, Principal Investigators

1 Aug. 1984 42 p refs ERTS
(Contract NAS5-27382)
(E85-10026; NASA-CR-174049; NAS 1.26:174049; QR-7) Avail: NTIS HC A03/MF A01 CSCL 08B

The reduction of the data measured on July 8, 1984 at White Sands, New Mexico is summarized. The radiance incident at the entrance pupil of the LANDSAT 5 sensors have been computed for bands 1 to 4. When these are compared to the digital counts of the TM image, the ground based calibration for this sensor will be given. The image was received from Goddard SFC and is presently being analyzed. Author

N85-11440*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THEMATIC MAPPING OF LIKELY TARGET AREAS FOR THE OCCURENCE OF CASSITERITE IN THE SERRA DO MOCAMBO (GO) GRANITIC MASSIFS USING LANDSAT 2 DIGITAL IMAGING [MAPEAMENTO TEMATICO DE AREAS-ALVOS FAVORAVEIS A OCORRENCIA DE CASSITERITA NO MACICO GRANITICO DA SERRA DO MOCAMBO (GO), A PARTIR DE IMAGENS DIGITAIS DO LANDSAT-2]
Raimundo AlmeidoFilho, Principal Investigator Jun. 1984 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Congr. Brasil. de Geologia, Rio de Janeiro, 28 Oct. - 4 Nov. 1984 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E85-10027; NASA-CR-174050; NAS 1.26:174050;
INPE-3153-PRE/532) Avail: NTIS HC A02/MF A01 CSCL 05B

The applicability of LANDSAT/MSS images, enhanced by computer derived techniques, as essential tools in mineral research was investigated and the Serra do Mocambo granitic massif was used as illustration. Given the peculiar factors founded in this area, orbital imagery permitted the delineation of potential target areas of mineralization occurrences, associated to albitized/greisenized types. Follow up prospection for primary tin deposits in this granitic massif should be restricted to the delineated areas which are less than 5% of the total superficial area of the massif. M.G.

N85-11441# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data and Information Service.
SURFACE SOIL MOISTURE MEASUREMENTS OF THE WHITE SANDS, NEW MEXICO
Gilbert R. Smith Sep. 1984 16 p refs
(NOAA-TM-NESDIS-7) Avail: NTIS HC A02/MF A01

Surface soil free moisture measurements of the White Sands gypsum dunes and flats in New Mexico were made over five day periods during the solstice and equinox. The percent by weight/bake-out method of moisture determination was used. The results of several periods of measurement were compiled and presented. The surface moisture content is a function of the season or amount of rainfall; the flats appear more moist than the dunes. Author

N85-11442# Geological Survey, Washington, D.C.
INTERNATIONAL STRATEGIC MINERALS INVENTORY. SUMMARY REPORT: MANGANESE
John H. DeYoung, Jr., David M. Sutphin, and William F. Cannon 1984 29 p refs
(GS-Circ-930-A) Avail: NTIS HC A03/MF A01

Major world resources of manganese, a strategic mineral commodity, are described. The International Strategic Minerals Inventory (ISMI) is a cooperative data collection effort of earth science and mineral resource agencies in Australia, Canada, the Federal Republic of Germany, the Republic of South Africa, and the United States of America. The report contains two parts. Part 1 presents an overview of the resources and potential supply of manganese on the basis of inventory information. Part 2 contains tables of some of the geologic information and mineral resource and production data that were collected by ISMI participants. E.A.K.

N85-11443# Geological Survey, Washington, D.C.
THE ALASKAN MINERAL RESOURCES ASSESSMENT PROGRAM: GUIDE TO INFORMATION CONTAINED IN THE FOLIO OF GEOLOGIC AND MINERAL-RESOURCE MAPS OF THE MEDFRA QUADRANGLE, ALASKA
W. W. Patton, Jr., E. J. Moll, and H. D. King 1984 16 p refs
(GS-Circ-928; LC-84-600057) Avail: NTIS HC A02/MF A01

The Medfra quadrangle in west-central Alaska was investigated by a multidisciplinary team of geoscientists to assess its mineral resources. This Circular is intended to serve as a guide to a folio of 13 separate Open-File Reports covering various aspects of these investigations, including geology, bedrock and stream-sediment geochemistry, potassium-argon dating, LANDSAT imagery, mineral occurrences, aeromagnetic interpretation, and mineral-resource assessment. This circular presents a complete reference list of these reports and a summary of the important results of each of the investigations. Author

N85-11444*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SHUTTLE EXPERIMENTAL RADAR FOR GEOLOGICAL EXPLORATION (SERGE) PROJECT: FIELD WORK RELATING TO THE SHUTTLE EXPERIMENTAL RADAR A (SIR-A) IN BRAZIL (PHASE 2) [PROJETO SERGE: TRABALHO DE CAMPO REFERENTE AO EXPERIMENTO SIR-A NO BRASIL (FASE 2)]
Milton Garcia Balieiro, Paulo Roberto Martini, Joao Roberto dosSantos, and Juercio Tavares deMattos Aug. 1984 197 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA (NASA-CR-174033; NAS 1.26:174033; INPE-3259-NTE/223) Avail: NTIS HC A09/MF A01 CSCL 05B

The ground observations undertaken over the northern position of Minas Gerais State, and part of Distrito Federal from 7 to 12 December 1982, along the Space Shuttle 2 flying orbit 22 of November 1981 are described. Field data related mostly with lithology, geological structures and forest cover, and specific geomorphological and pedological aspects were collected. Ground data are applied to evaluate the SIR-A Experiment, developed in the Space Shuttle-2 mission for natural resources mapping and prospecting. Author

N85-11445# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
DIGITAL TERRAIN ELEVATION DATA (DTED) ANOMALY REMOVAL THROUGH THE USE OF AN INTERACTIVE FOURIER FREQUENCY FILTERING PROCESS Interim Report, 1983 - 1984
R. L. Fortson 2 Jul. 1984 34 p Original contains color illustrations
(AD-A145433) Avail: NTIS HC A03/MF A01 CSCL 08/2

The Defense Mapping Agency is a producer of raster formatted elevation data in a form called DTED (Digital Terrain Elevation Data). This data is collected from digitized source maps and from optically or digitally correlated stereopairs of photographic imagery. The various means used in producing DTED sometimes introduce a striation anomaly into the data. Conventional techniques for handling this anomaly have included the use of convolution with smoothing filters. Smoothing, however, degrades the high quality resolution of the data. A more precise method specific only to the anomaly was required. To accomplish this, an interactive Fourier frequency filtering program was designed to allow analysis and filtering of the DTED in the frequency domain. The process allows the analyst to use the data's amplitude spectrum as an aid in designing an area specific low-pass, band-reject, or fan-reject filter. This technique can result in almost total elimination of the striation anomaly with virtually no degradation of the high quality resolution of the data. Author (GRA)

N85-11446# Army Engineer Topographic Labs., Fort Belvoir, Va.
TERRAIN ANALYSIS PROCEDURAL GUIDE FOR SURFACE CONFIGURATION Technical Report
O. Mintzer and J. A. Messmore Mar. 1984 268 p
(AD-A145637; ETL-0352) Avail: NTIS HC A12/MF A01 CSCL 15/4

This guide is an instructional manual for the use by the U.S. Army Terrain Analyst when preparing the following factor overlays: slope, landform, and surface roughness. These overlays are constructed form the analysis of the combined data extracted from literature, topographic maps, and aerial/LANDSAT imagery. A catalog section includes the descriptions of photo pattern, topographic map, and surface roughness data elements for thirty-seven typical topographic/geologic forms. Additional topics include: Remote sensing, Military geographic information, Geology/Soils, Factor Mapping, Aerial Photography, and Photointerpretation. GRA

N85-11447# Rome Univ. (Italy). Ist. di Fisica.
DETERMINATION OF THE CONSERVATION STATE OF LONG CONSERVATION AGRICULTURAL PRODUCTS BY MEANS OF CAPACITIVE SENSORS [DETERMINAZIONE DELLO STATO DI CONSERVAZIONE DI PRODOTTI AGRICOLI A LUNGA CONSERVAZIONE TRAMITE SENSORI CAPACITIVI]
G. Careri and A. Giansanti 10 Mar. 1983 10 p refs In ITALIAN (Contract CNR-79-00969)
(Nota-Interna-799) Avail: NTIS HC A02/MF A01

Experiments were carried out to select the optimum frequency and sample size in capacitive moisture measurement of cereals stored under nitrogen. The sample weight variation, dielectric constant, and loss angle were measured at 10 frequencies between 10 KHz and 10 MHz. The frequency band in which dielectric loss is a reliable parameter is between 10 KHz and 1 MHz. In each case a calibration is necessary to account for the type of cereal and the sample cell dimensions. Author (ESA)

N85-11448# Research Inst. of National Defence, Stockholm (Sweden). Central Planning and Administration.
APPLICATIONS OF REMOTE SENSING TECHNIQUES TO OCEANOGRAPHY AND SEA ICE
Ragnar Thoren Apr. 1984 15 p
(FOA-B-60004-M7; ISSN-0281-0263) Avail: NTIS HC A02/MF A01; Research Institute of National Defence, Stockholm KR25

Methods for position-fixing and navigation in and under sea ice are described, and the importance of a true knowledge of the bottom topography is discussed. Submarines, diving, seismology, and hydroacoustic/optic integrated systems for navigation in Arctic waters are considered. Cargo submarines and liquid natural gas submarine tankers; radio communication systems for submarines operating under ice; and plate tectonics and technology of deep ocean mining are treated. Author (ESA)

N85-11449# Ruhrkohle A.G., Essen (West Germany).
INTERACTIVE SYSTEM FOR THE INTERPRETATION OF COAL DEPOSIT DATA AS A BASIS OF FUTURE MINE PLANNING SYSTEMS Final Report, Dec. 1981
Rudolf Dann, Martin Hugger, Klaus Luetzenkirchen, Bernd Ruthe, Juergen Thomek, Rolf Schulte-Ontrop, and Helmut Zander Bonn Bundesministerium fuer Forschung und Technologie Jun. 1983 122 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-115; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

A three dimensional computer aided design system for the evaluation and graphical representation of coal deposit structures is described. The Digital Interactive Geological and Mine Analysis and Planning System (DIGMAP) assembles all information about geophysical measurements and mine openings within one data base and aids its interactive processing up to a consistent image of deposit structures. The DIGMAP was successfully tested using data from a working mine. Author (ESA)

N85-11450# Preussag A.G., Erdoel und Erdgas, Hannover (West Germany).
DEVELOPMENT OF A METHOD FOR EXPLORING LOW-REFLECTANCE AREAS THROUGH THE COMBINED USE OF DIFFERENT GEOPHYSICAL METHODS TAKING THE NORTH-WEST GERMAN BASIN AS AN EXAMPLE Final Report, Dec. 1981
Gerhard Dohr Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 68 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-180; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

Exploration of mineral resources and hydrocarbons in areas with poor quality in reflection seismics is considered. The northwest German basin was selected as an example because of the numerous existing gravimetric and magnetic measurements. A basin study was made by a synopsis of gravimetric and aeromagnetic results. The effects of folded carboniferous strata on the interpretability of reflection seismic data were investigated. The result is a conception of the configuration of the north-west German basin which differs from existing theories, and indicates how to explore similar areas which cannot be explored by seismic work only. Author (ESA)

N85-11451# Technische Hochschule, Aachen (West Germany). Lehr- und Forschungsgebiet fuer Hydrogeologie.
INVESTIGATION OF MINERAL AND THERMOMINERAL SPRINGS IN THE EIFEL MOUNTAINS REGARDING THERMAL INDICATIONS Final Report, Sep. 1982
Horst-Robert Langguth, Hans Plum, Annkarin-Aurelia Kimmelmann, Alfred Hollerbach, Manfred Wolf, and Reiner Schulz Bonn Bundesministerium fuer Forschung und Technologie Jan. 1984 176 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-019; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34

In the east Eifel area (Germany) a local anomaly of SiO2-content and Na/K-ratios was found in mineral waters emerging around lake Laach. The diameter of the anomalous area is 10 to 12 km. Results obtained from the chemical investigations indicate that the chemical anomaly is caused by a local temperature anomaly in the lake Laach area. In the rest of the investigation area nonsignificant temperature anomalies were discovered. The calculation of geotemperatures was only possible in higher concentrated thermal waters with low CO2 contents. The calculated subsurface temperatures are: in Aachen 125 C, in Chaudfontaine 30 C, in Bad Bertrich 70 to 75 C and in Strotzbusch 60 C. Due to the geological situation a deep circulation of the fluids is regarded as the reason for the observed geotemperatures. Author (ESA)

N85-11024*# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data, and Information Service.
LAND REMOTE SENSING COMMERCIALIZATION: A STATUS REPORT
William P. Bishop and E. Larry Heacock *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 87-95 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

N85-11025*# Metrics, Inc., Atlanta, Ga.
THE FUTURE OF SATELLITE REMOTE SENSING: A WORLD-WIDE ASSESSMENT AND PREDICTION Abstract Only
G. William Spann *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 96 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

N85-11026*# Geosat Committee, Inc., San Francisco, Calif.
INDUSTRIAL USE OF LAND OBSERVATION SATELLITE SYSTEMS
Frederick B. Henderson, III *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 97-101 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

N85-11028*# Intergraph Corp., Huntsville, Ala.
LANDSAT DATA AND INTERACTIVE COMPUTER MAPPING
Richard K. Grady *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 103-109 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05B

N85-11029*# Alabama A & M Univ., Normal.
AGRIBUSINESS AND SPACE: NO LIMITS TO GROWTH
Oscar L. Montgomery and Charles T. N. Paludan (Tennessee Univ. Space Inst., Tullahoma) *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 110-119 refs (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 20C

N85-11397# Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
SPATIAL RELATIONSHIPS IN STREAM FLOW RESIDUALS
G. G. S. Pegram *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 134-155 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11398# National Physical Research Lab., Pretoria (South Africa).
THE APPLICATION OF PRINCIPAL COMPONENTS ANALYSIS TO LANDSAT MSS DATA
M. Lasserre, O. G. Malan, and B. Turner *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 156-168 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11399# Witwatersrand Univ., Johannesburg (South Africa). Centre for Resource Ecology.
REDUCING SPECTRAL DIMENSION OF REMOTELY SENSED DATA USING PRINCIPAL COMPONENTS ANALYSIS AND A PEANO SCANNING
Neil Pendock and Michael Sears *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 169-186 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11069# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON COSMONAUTS GEOLOGICAL MAPPING, PHOTOGRAPHY Abstract Only
B. Mozhayev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 16 Transl. into ENGLISH from Pravda (Moscow), 12 Jul. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11112# Joint Publications Research Service, Arlington, Va.
METHOD FOR INTERPRETING SOIL COVER OF FLOWED FIELDS USING SPECTRAL BRIGHTNESSES MEASURED FROM SPACE PHOTOGRAPHS Abstract Only
L. N. Vasilyev and A. G. Poluarshinova *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 102-103 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 51-57 Original language document announced as A84-28689 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11113# Joint Publications Research Service, Arlington, Va.
SPACE OBSERVATION OF LATITUDINAL CHANGES IN VEGETATION COVER Abstract Only
V. A. Kottsov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 103-104 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 58-61 Original language document announced as A84-28690 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11114# Joint Publications Research Service, Arlington, Va.
EVALUATING EFFECTIVENESS OF USING SPACE INFORMATION IN SPECIALIZED HYDROGEOLOGICAL RESEARCH Abstract Only
I. M. Galperin and Yu. L. Obyedkov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 104 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 68-72 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11115# Joint Publications Research Service, Arlington, Va.
ECONOMIC EVALUATION OF SPACE SURVEY MATERIALS USE IN LAND IMPROVEMENT ENGINEERING FIELD WORK Abstract Only
V. I. Corbunov and N. A. Romanova *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Feb. 1984 p 105 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 73-79 Original language document announced as A84-28693 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11116# Joint Publications Research Service, Arlington, Va.
PREDICTING OPTICAL IMAGE DISPLACEMENT VELOCITY IN SURVEY OF EARTH'S SURFACE Abstract Only
A. B. Batrakov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 106 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 79-85 Original language document announced as A84-28694 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11117# Joint Publications Research Service, Arlington, Va.
METHODS FOR DETERMINING ATMOSPHERIC OPTICAL PARAMETERS USING RESULTS OF SPACE SURVEY OF EARTH'S SURFACE Abstract Only
D. A. Usikov, M. N. Pomenkova, and I. V. Shiyan *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Jan. 1984 p 107 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 86-91 Original language document announced as A84-28695 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11118# Joint Publications Research Service, Arlington, Va.
TECHNOLOGICAL APPROACH TO AUTOMATION OF SPECIALIZED PROCESSING OF SURVEY DATA Abstract Only
Ye. D. Dogdanskiy, L. A. Kuzenkov, and R. I. Elman *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 108 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 92-100 Original language document announced as A84-28696 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11119# Joint Publications Research Service, Arlington, Va.
CHOICE OF CARTOGRAPHIC PROJECTION FOR SPACE SYSTEM DATA BANK USED IN STUDYING NATURAL RESOURCES Abstract Only
V. I. Khizhnichenko *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 109 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 100-109 Original language document announced as A84-28697 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-11452# Stanford Univ., Calif.
PREPARATION AND PROPERTIES OF EVAPORATED CdTe

FILMS COMPARED WITH SINGLE CRYSTAL CdTe Annual Report, 1 Feb. 1983 - 31 Jan. 1984
R. Bube, A. Fahrenbruch, C. Fortmann, and T. Thorpe Sep. 1984 33 p refs
(DE85-000502; SERI/STR-211-2445) Avail: NTIS HC A03/MF A01

Variation of CdS/CdTe/graphite thin film solar cell properties as a function of the temperature for CdS film deposition was investigated. A maximum open-circuit voltage of 0.67 V was found for a deposition temperature of 160 C, corresponding to a CdS film resistivity of 150 ohm-cm. The effect of coating the graphite before CdTe deposition with 20A of Au, or 5 to 50A or Cu, was investigated. Photovoltaic parameters of thin film CdS/CdTe/graphite solar cells as a function of storage time to check the stability of these cells were studied. It is found that heat treatment of CdS/CdTe/graphite solar cells in air increases the cell resistivity and decreases the fill factor, whereas heat treatment in hydrogen produces the reverse effect. The hole density is not affected by such heat treatment, which suggests that the observed effects are associated with the grain boundaries in the film. A computer model was developed to investigate the bond length changes produced by an impurity atom which occupies a substitutional site in the CdTe lattice. The model is used to device the interaction of impurities with native defects through a strain interaction.
Author

N85-11453# Burt, Hill, Kosar, Rittleman, and Associates, Butler, Pa.
AUTOMATED INSTALLATION METHODS FOR PHOTOVOLTAIC ARRAYS 2
D. R. Zaremski, Jr., M. Cooper (Westinghouse Corp.), R. L. Briggs (Westinghouse Corp.), and E. Federmann (Westinghouse Corp.) Jun. 1984 183 p refs
(Contract DE-AC04-76DP-00789)
(SAND-84-7035) Avail: NTIS HC A09/MF A01

Standard installation methods and the automated/mechanized method which are considered likely to reduce the overall installation costs of large photovoltaic arrays were investigated. Details of installation scenarios for standard and mechanized approaches are presented, and the equipment and hardware necessary for each step in the installation process are identified and characterized. To be cost effective, automated installation methods must be integrated early in the design of photovoltaic products and systems.
E.A.K.

N85-11454# Hughes Aircraft Co., Long Beach, Calif.
MODULAR PHOTOVOLTAIC ARRAY FIELD Final Report
Sep. 1984 123 p
(Contract DE-AC04-76DP-00789)
(SAND-83-7028) Avail: NTIS HC A06/MF A01

The procurement, fabrication, assembly, installation, and test of a fixed flat panel photovoltaic (PV) array field composed of modular 10 kWp building blocks is described. The objective of this program is to verify the balance of systems costs developed under the prior study contract. Major features of the balance of system incorporated + or - 200 Vdc bipolar circuitry, a low cost hybrid structure/foundation which features a frameless panel and self-grounding foundation, and a power collection center for housing the modular system controls and protection circuits. It is shown that the objective to an install, a low cost balance of systems for an intermediate power, flat-panel photovoltaic array field is realized.
E.A.K.

N85-11455*# Clarkson Coll. of Technology, Potsdam, N.Y.
ELECTROCATALYSIS OF FUEL CELL REACTIONS: INVESTIGATION OF ALTERNATE ELECTROLYTES Final Report
Der-Tau Chin, K.-L. Hsueh, and H. H. Chang Jan. 1984 114 p refs
(Grant NAG3-238; Contract DE-AI21-80ET-17088)
(NASA-CR-174753; DOE/NASA/0238-1; NAS 1.26:174753) Avail: NTIS HC A06/MF A01 CSCL 10A

Oxygen reduction and transport properties of the electrolyte in the phosphoric acid fuel cell are studied. The areas covered were: (1) development of a theoretical expression for the rotating ring disk electrode technique; (2) determination of the intermediate reaction rate constants for oxygen reduction on platinum in phosphoric acid electrolyte; (3) determination of oxygen reduction mechanism in trifluoreomethanesulfonic acid (TFMSA) which was considered as an alternate electrolyte for the acid fuel cells; and (4) the measurement of transport properties of the phosphoric acid electrolyte at high concentrations and temperatures.
Author

N85-11456*# Cleveland State Univ., Ohio.
PHOSPHORIC ACID FUEL CELL POWER PLANT SYSTEM PERFORMANCE MODEL AND COMPUTER PROGRAM Final Report
Kalil A. Alkasab and Cheng-yi Lu Jan. 1984 134 p refs
(Contracts NCC3-17; DE-AI21-80ET-17088)
(NASA-CR-174638; DOE/NASA/0017-1; NAS 1.26:174638) Avail: NTIS HC A07/MF A01 CSCL 10A

A FORTRAN computer program was developed for analyzing the performance of phosphoric acid fuel cell power plant systems. Energy mass and electrochemical analysis in the reformer, the shaft converters, the heat exchangers, and the fuel cell stack were combined to develop a mathematical model for the power plant for both atmospheric and pressurized conditions, and for several commercial fuels.
Author

N85-11457*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical, Computer and Systems Engineering.
RESEARCH ON GALLIUM ARSENIDE DIFFUSED JUNCTION SOLAR CELLS Final Report, 1 Oct. 1982 - 30 Jun. 1984
J. M. Borrego and S. K. Ghandi Oct. 1984 54 p refs
(Grant NAG3-188)
(NASA-CR-174057; NAS 1.26:174057) Avail: NTIS HC A04/MF A01 CSCL 10A

The feasibility of using bulk GaAs for the fabrication of diffused junction solar cells was determined. The effects of thermal processing of GaAs was studied, and the quality of starting bulk GaAs for this purpose was assessed. These cells are to be made by open tube diffusion techniques, and are to be tested for photovoltaic response under AMO conditions.
B.G.

N85-11458*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AILERON CONTROLS FOR WIND TURBINE APPLICATIONS
Dean R. Miller and Richard L. Putoff Nov. 1984 14 p refs Presented at the Intersociety Conversion Eng. Conf., San Francisco, 19-24 Aug. 1984
(Contract DE-AI01-76ET-20320)
(NASA-TM-86867; DOE/NASA/20320-602; E-2330; NAS 1.15:86867) Avail: NTIS HC A02/MF A01 CSCL 10A

Horizontal axis wind turbines which utilize partial or full variable blade pitch to regulate rotor speed were examined. The weight and costs of these systems indicated a need for alternate methods of rotor control. Aileron control is an alternative which has potential to meet this need. Aileron control rotors were tested on the Mod-O wind turbine to determine their power regulation and shutdown characteristics. Test results for a 20 and 38% chord aileron control rotor are presented. Test is shown that aileron control is a viable method for safety for safely controlling rotor speed, following a loss of general load.
E.A.K.

N85-11459# California Univ., Los Angeles. Dept. of Electrical Engineering.
SILICON SHEET WITH MOLECULAR BEAM EPITAXY FOR HIGH EFFICIENCY SOLAR CELLS Final Technical Report, 22 Mar. 1982 - 30 Apr. 1984
1984 105 p refs Prepared for JPL
(Contract NAS7-100)
(NASA-CR-174022; DOE/JPL-956233-83/2; NAS 1.26:174022; DE84-014923) Avail: NTIS HC A06/MF A01 CSCL 10A

The growth of silicon solar cells of high efficiency was undertaken. The MBE offers the potential of growing complex

and arbitrary doping profiles with 10-A depth resolution. It is the only technique that can readily grow built in front and back surface fields of any desired depth and value in silicon solar cells, or the more complicated profiles needed for a double junction cascade cell, all in silicon, connected in series by a tunnel junction. Although the dopant control required for such structures was demonstrated in silicon crystal quality at the p-n junctions is still too poor to allow the other advantages to be exploited. A computer analysis of the double cascade all in silicon shows that efficiencies can be raised over that of any single silicon cell by 1% or 2%, and that open circuit voltage of almost twice that of a single cell are possible. DOE

N85-11460# Pacific Northwest Lab., Richland, Wash.
BENCH-SCALE RESEARCH IN BIOMASS DIRECT LIQUEFACTION
D. C. Elliott May 1984 25 p refs Presented at 16th Biomass Conversion Contractors Meeting, Portland, Oreg., 8 May 1984
(Contract DE-AC06-76EL-01830)
(DE84-011881; PNL-SA-12258; CONF-8405157-3) Avail: NTIS HC A02/MF A01

Biomass liquefaction and hydrotreatment studies of biomass derived liquids is discussed. Evaluation of the current research ongoing in the participating countries provided a focus on the areas of need and continuing cooperation and communication is proposed. Continuing hydrotreating research provided insights into techniques for converting the initial product of biomass liquefaction into a mixture of hydrocarbon liquids. This gasoline blending stock was produced from both distillate and whole product in the presence of commercially available catalysts and processing conditions. DOE

N85-11461# Midwest Research Inst., Golden, Colo.
HYDROGEN PASSIVATION OF ELECTRICALLY ACTIVE DEFECTS IN CRYSTALLINE SILICON SOLAR CELLS
Joseph B. Milstein, Y. Simon Tsuo, Carl R. Osterwald, and C. W. White (ORNL, Tenn.) Jun. 1984 8 p refs Presented at the 17th IEEE Photovoltaic Specialists Conf., Kissimmee, Fla., 1-5 May 1984
(Contracts DE-AC02-83CH-10093; DE-AC05-84OR-21400)
(DE84-004590; SERI/TP-211-2345; CONF-840561-18) Avail: NTIS HC A02/MF A01

Significant improvements in the efficiencies of dendritic web and edge-supported-pulling (ESP) silicon sheet solar cells were observed after hydrogen ion beam passivation for a period of ten minutes or less. The effects of the hydrogen ion beam treatment were studied with respect to silicon material damage, silicon sputter rate, introduction of impurities, and changes in reflectance. It was determined that the silicon sputter rate for a constant ion beam flux of 0.60 + - 0.05 mA/cm(2) exhibits a maximum at approximately 1400 eV ion beam energy. Hydrogen ion beam treatment can result in a reduced fill factor, which is caused by damage to the front metallization of the cell rather than by damage to the p-n junction. DOE

N85-11462# Midwest Research Inst., Golden, Colo. Solar Electric Research Div.
RESEARCH DIRECTIONS AND PROGRESS IN THE SERI ADVANCED HIGH EFFICIENCY CONCEPT PROGRAM
Lee A. Cole and John P. Benner Jun. 1984 8 p refs Presented at the 17th IEEE Photovoltaic Specialists Conf., Kissimmee, Fla., 1-5 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-004592; SERI/TP-2325; CONF-840561-15) Avail: NTIS HC A02/MF A01

The inherent electro-optical properties of gallium arsenide (GaAs) and related III-V compounds make this class of semiconductors an optimum choice for use in very high efficiency solar cells. The ability to alloy GaAs with other column III and V elements while maintaining the single crystal zincblende structure allows the photovoltaic properties to be tailored to specific needs. The current understanding and control of the properties of these materials is more advanced than for any other semiconductor except single crystal silicon. For these reasons, the Advanced High Efficiency Concepts Program supports materials research to improve the properties of III-V semiconductors needed to achieve the maximum attainable photovoltaic conversion efficiencies. DOE

N85-11463# Westinghouse Research and Development Center, Pittsburgh, Pa.
LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 23 Oct. - 31 Dec. 1983
C. S. Duncan, R. G. Seidensticker, and J. P. McHugh 6 Mar. 1984 39 p refs Prepared for JPL
(Contract NAS7-100)
(NASA-CR-174021; DOE/JPL-955843-84/13; NAS 1.26:174021; DE84-010212) Avail: NTIS HC A03/MF A01 CSCL 10A

Two types of design concepts were evaluated with the thermal models: (1) a vertical thermal element which modifies both the temperature profile in the web and the convective gas flow near the web; (2) a thinner lid configuration in which the second lid is replaced by a hot cavity. Each involves tradeoffs which need experimental evaluation. Residual stress measurements using the serial split width technique indicated that the real residual stress was comparable to the equivalent residual stress, which was used as a measure of structural perfection in web crystals in previous reports. New dynamic and new static configurations were given preliminary evaluation in the laboratory, and the results were generally in agreement with the predictions. Improved system temperature were measured which leads to growth in closer agreement with the model predictions. Improved methods for controlling convective gas flow and oxide deposition was developed. DOE

N85-11464# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DOE/SERI POLYCRYSTALLINE THIN-FILM PHOTOVOLTAIC RESEARCH
A. Hermann, K. Zweibel, and R. Mitchell May 1984 8 p refs Presented at 17th IEEE Photovoltaic Specialists Conf., Kissimmee, Fla., 1 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-004516; SERI/TP-211-2316; CONF-840561-20) Avail: NTIS HC A02/MF A01

Recent results, status, and future prospects for the polycrystalline thin film photovoltaic program are pressured. Heterojunctions based on CuInSe2 and on CdTe were studied. Both materials hae attained over 10% efficiency in polycrystalline form. CuInSe2 is emphasized, for which 11% efficient device is reported. The composition/electronic properties of CuInSe2 and its response to post deposition annealing was investigated. In the CdTe research, ohmic, stable back contacting and control of p-type doping are investigated. Efforts to study polycrystalline two junction stacked cells with two terminal cells and with four terminal cells. This preliminary work is expected to be expanded, with emphasis on CdTe and other top cell materials. A number of new research areas is reported. Transparent ohmic contacts to p-CdTe and subbandgap light losses in polycrystalline materials. The aim is to produce stable, high efficiency, thin film cells which can be deposited inexpensively by techniques that are scalable to large areas. DOE

N85-11465# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
RESEARCH ON CRYSTALLINE SILICON SOLAR CELLS
J. B. Milstein and Y. S. Tsuo Jun. 1984 6 p refs presented at 17th IEEE Photovoltaic Specialists Conf., Kissimmee, Fla., 1 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-114591; SERI/TP-211-2347; CONF-840561-17) Avail: NTIS HC A02/MF A01

Results of research and future directions for research on crystalline silicon solar cells are discussed. The physical, chemical, and electrical transport properties of grain boundaries and other electrically active defects are discussed. DOE

N85-11466# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
RESEARCH ON PHOTOELECTROCHEMICAL CELLS BASED ON CdSe, CdSe/SUB 1-X/Te/SUB X AND OTHER PHOTOELECTRODE MATERIALS
W. L. Wallace May 1984 7 p refs Presented at 17th IEEE Photovoltaic Specialists Conf., Kissimmee, Fla., 1 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-004527; SERI/TP-211-2352; CONF-840561-19) Avail: NTIS HC A02/MF A01

Research on electrochemical photovoltaic incorporating thin film n-CdSe and n-CdSe sub 1-x/Te sub x photoanodes resulted in efficiencies up to 7.5% using small area electrodes in polysulfide electrolytes. Efficiencies close to 10% can be achieved using alternate electrolytes in significantly less stable systems. The major limitations on the efficiency of II-VI photoelectrochemical cells are associated with the open circuit voltage and the fill factor. Research on CuInSe2 electrochemical photovoltaic cells resulted in efficiencies up to 11.7% using single crystal n-CuInSe2 photoanodes in aqueous electrolytes. The n-CuInSe2 surface and the electrolyte were optimized to produce a highly stable semiconductor/electrolyte junction. A review is also be given on the status of photoelectrochemical storage cell research. In situ photoelectrochemical measurement techniques were used to probe the semiconductor/electrolyte interface and were used to support the characterization of semiconductor materials for solid state photovoltaic applications. DOE

N85-11062# Joint Publications Research Service, Arlington, Va.
FEATURES OF NEW SOLAR PANELS ON SALYUT-7 Abstract Only
G. Lomanov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 2 Transl. into ENGLISH from Sotsialisticheskaya Ind. (Moscow), 20 May 1984 p 4 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11691# Joint Publications Research Service, Arlington, Va.
THIN FILM (Al, Ga)As HETEROJUNCTION SOLAR CELLS Abstract Only
V. I. Brynzar, V. V. Dorogan, M. B. Ivanov, V. G. Trofim, V. A. Chumak, and L. I. Cheban *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 32 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 8, 26 Apr. 1984 p 455-459 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11749# Joint Publications Research Service, Arlington, Va.
CASCADED SOLAR PHOTOVOLTAIC CELLS BASED ON InP-GaInPAs AND InP-CdS HETEROSTRUCTURES Abstract Only
A. M. Allakhverdiyev, V. Andreyev, I. A. Guseynov, O. O. Iventyeva, and V. I. Ismailov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 23-24 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 51-55 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-11467 Drexel Univ., Philadelphia, Pa.
AEROSOL SAMPLING BIAS FROM DIFFERENTIAL ELECTROSTATIC CHARGE AND PARTICLE SIZE Ph.D. Thesis
Michael Anthony Jayjock 1984 163 p
Avail: Univ. Microfilms Order No. DA8415624

The possible biasing effects of differential electrostatic charge, particle size and their interaction on the sampling accuracy of standard aerosol measuring methodologies were investigated. Field studies were first conducted to determine the levels and variability of aerosol particle size and charge at two manufacturing facilities making acrylic powder. The field work showed that the particle mass median aerodynamic diameter (MMAD) varied by almost an order of magnitude while the aerosol surface charge was relatively stable. The second part of this work was a series of laboratory experiments in which aerosol charge and MMAD were manipulated in a 2(n) factorial design with the percentage of sampling bias for various standard methodologies as the dependent variable. Despite some ill conditioning of the independent variables due to experimental difficulties, statistical analysis has shown aerosol charge (at levels comparable to those measured in workroom air) is capable of having a significant biasing effect. Physical models consistent with the sampling data indicate that the level and bipolarity of the aerosol charge are determining factors in the extent and direction of the bias. Dissert. Abstr.

N85-11468# Defence Research Information Centre, Orpington (England).
RADIOTRACER STUDIES OF THE DISPERSION OF SOLID POLLUTANTS IN MARINE AND ESTUARIAL ENVIRONMENT: MEASUREMENT OF DIFFUSION COEFFICIENTS AND THE PHENOMENON OF DISPERSION BY CURRENTS
G. Sauzay, G. Allen, A. Caillot, and G. Courtois Mar. 1984 34 p refs Transl. into ENGLISH from proceedings of the Intern. Symp. on Develop. of Nucl. Based Tech. for Measurement, Detection and Control of Environ. Pollutants, 1976 p 567-591 Symp. held Mar. 1976
(BLL-DRIC-Trans-7104-(3623.66)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Two examples of fairly large-scale experiments in a marine and an estuarine environment which studied the circulation and dispersion of pollutants in the natural environment are described. The extent to which full-scale measurements in the field can supply additional information which could not have been predicted by a mathematical model is discussed. B.W.

N85-11469# Institute for Energy Analysis, Oak Ridge, Tenn.
THE CHANGING PATTERN OF FOSSIL FUEL CO2 EMISSIONS
Ralph M. Rotty, Gregg Marland, and Ned Treat Washington Sep. 1984 30 p refs
(Contract DE-AC05-76OR-00033)
(DOE/OR-21400/2; TR014) Avail: NTIS HC A03/MF A01

The world is divided into six fuel consuming regions, and for each region, growth in CO2 emissions during the past three decades is analyzed. Not only have fossil fuel CO2 emissions from the developing nations been growing at a higher rate than those from the developed world, but the developing nations do not show the reduction in growth rate evident in the data for North America, Western Europe, and Japan following 1973. Data for nations with centrally planned economies do not show steady growth rates during either 1950-1973 or 1973-1980, nor is the typical discontinuity of 1973 evident. The emission growth rate decreases steadily during the entire three decades - each year the increase over the previous year becomes proportionally smaller. For the next few decades increases in atmospheric CO2 concentrations will be largely determined by fuel policies in the developed nations of the world, but before the middle of the next century, fuel policies of the rapidly growing nations will become extremely important, in the world CO2 picture. M.A.C.

N85-11470# Los Alamos Scientific Lab., N. Mex.
OBSERVED RATE OF TROPOSPHERIC DIFFUSION
F. A. Gifford Jul. 1984 17 p refs
(Contract W-7405-eng-36)
(DE84-016047; LA-10181-MS) Avail: NTIS HC A02/MF A01

Recent Australian plume width measurements to 1000 km downwind from an isolated stack, together with existing relative diffusion data from a wide variety of tropospheric relative diffusion sources, are analyzed to determine the value of p in the equation fo the cloud width standard deviation, sigma sub y proportional to t sup p, where t is travel time downwind. The data suggest that there are three regimes of quasi-instantaneous cloud diffusion: an irregular but, on the average, approximately linear growth region extending from 0 to 2 h travel time; a regime of accelerating

diffusion (i.e., p > 1) extending from 2 to about 15 h; and an approach to a parabolic (p approximately equal 1/2) stage of diffusion at about 40 h. DOE

N85-11471# PEDCo-Environmental, Inc., Cincinnati, Ohio.
ANALYSIS OF POTENTIAL COMBUSTION SORCE IMPACTS ON ACID DEPOSITION USING AN INDEPENDENTLY DERIVED INVENTORY, VOLUME 1
Dec. 1983 224 p refs Prepared in cooperation with Spaite (Paul. O.) Co.
(Contract DE-AC21-82MC-19285)
(DE84-012005; DOE/MC-19285-1505-Vol-1) Avail: NTIS HC A10/MF A01

Three major objectives are identified. The first objective was to develop a fossil fuel combustion source inventory (No sub x, SO sub x, and hydrocarbon emissions). The second objective was to use the inventory data as a basis for selection of a number of areas that could be further studied to assess the impact of local and intraregional combustion sources. The third objective was to conduct an analysis of wet deposition monitoring data in the areas under study, along with pertinent physical characteristics, meteorological conditions, and emission patterns of these areas to investigate probable relationships between local and intraregional combustion sources and the deposition of acidic material. The combustion source emissions inventory was developed for the eastern United States. Three regions with basically different emission patterns were identified and characterized. The statistical analysis of wet deposition monitoring data in conjunction with emission patterns, wind direction, and topography produced consistent results for each study area and demonstrated that the wet deposition in each area reflects the characteristics of the localized area around the monitoring sites (typically 50 to 150 miles). DOE

N85-11472# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
ESTIMATION OF THE POTENTIAL AND PROBABLE SOURCE REGIONS FOR ACID PRECIPITATION Final Report
P. J. Samson, M. E. Fernau, M. S. Halpert, J. D. Kahl, and G. J. Keeler Jul. 1984 92 p refs
(Contract DE-AC02-82ER-60058)
(DE84-015119; DOE/ER-60058/1) Avail: NTIS HC A05/MF A01

Concentrations of ionic species collected in the Multistate Atmospheric Power Production Study (MAP3S) have been diagnosed to ascertain whether a relationship exists between the concentrations of sulfate and nitrate in precipitation and the magnitude of estimated upwind emissions of sulfur dioxide and nitrogen oxides, respectively. It was found that, even when segregated by season, the data fail to exhibit any well-defined relationship between emissions and resultant concentrations. Additionally, no significant correlation could be discerned between sulfate concentrations in precipitation and the inverse of estimated upwind wind speed. A regional-scale sulfur transport and deposition model was employed to estimate source-receptor relationships for sulfur compounds at each of the MAP3S receptors for each of three years, 1979 to 1981. These calculations illustrate that the range of variation in many specific source-receptor relationships may be as large as the absolute value of the source-receptor relationship itself. DOE

N85-11473# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
A DISPERSION MODEL FOR AIRBORNE PARTICULATES INSIDE A BUILDING
William C. Perkins and Dean H. Stoddard Jul. 1984 38 p refs Presented at the 18th DOE Nucl. Airborne Waste Management and Air Cleaning Conf., Baltimore, 13-16 Aug. 1984 Submitted for publication
(Contract DE-AC09-76SR-00001)
(DE84-014961; DP-MS-83-136; CONF-840806-2) Avail: NTIS HC A03/MF A01

An empirical model was developed for the spread of airborne radioactive particles after they are released inside a building. The model is useful in performing safety analyses of actinide materials facilities. The facilities employ the multiple air zone concept; in which, ventilation air flows from rooms or areas of least radioactive material hazard, through zones of increasing hazard, to a treatment system. The model gives ratios of the airborne activity concentrations in rooms and corridors near the site of the release. All data are normalized to the data from the air sampler nearest the release point. The model can be applied in predicting airborne activity concentrations from particulate releases elsewhere, if the facility in question has similar features of floor plan, air velocity, and air flow direction. The multiple air zone concept was applied to many designs of nuclear facilities as a safety feature to limit the spread of airborne activity from a release. The model illustrates the limitations of this concept: it predicts an apparently anomalous behavior of airborne particulates, a small migration against the flow of the ventilation air. The following phenomena are suggested as possible mechanisms for this migration: eddy currents in the air flow; leaks of ventilation air between zones; open doors; movement of personnel during an incident; inadequate flow of ventilation air; and thermal gradients. DOE

N85-11474# Pacific Northwest Lab., Richland, Wash.
GREEN RIVER AIR QUALITY MODEL DEVELOPMENT: METEOROLOGICAL AND TRACER DATA, JULY/AUGUST 1982. FIELD STUDY IN BRUSH VALLEY, COLORADO
C. D. Whiteman, R. N. Lee, M. M. Orgill, and B. D. Zak (Sandia National Lab.) Jun. 1984 157 p refs
(Contract DE-AC06-76RL-01830)
(DE84-014975; PNL-5163) Avail: NTIS HC A08/MF A01

Meteorological and atmospheric tracers studies were conducted during a 3 week period in July and August of 1982 in the Brush Creek Valley of northwestern Colorado. The objective of the field experiments was to obtain data to evaluate a model, VALMET, to predict dispersion of air pollutants released from elevated stack located within a deep mountain valley in the post sunrise temperature inversion breakup period. Three tracer experiments were conducted in the valley during the 2 week period. Sulfur hexafluoride (SF6) was released from a height of approximately 100 m, beginning before sunrise and continuing until the nocturnal down valley winds reversed several hours after sunrise. Dispersion of the sulfur hexafluoride after release was evaluated. Tracer samples were collected using a network of radio controlled bag sampling stations, two manually operated gas chromatographs, a continuous SF6 monitor, and a vertical SF6 profiler. Basic meteorological data were collected during the tracer experiments. DOE

N85-11475# New Hampshire Univ., Durham. Water Resources Research Center.
POTENTIAL FOR ACIDIFICATION OF SIX REMOTE PONDS IN THE WHITE MOUNTAINS OF NEW HAMPSHIRE
D. C. Buso, C. W. Martin, and J. W. Hornbeck Feb. 1984 165 p refs Prepared in cooperation with Northeastern Forest Experiment Station, Durham, N.H.
(Contract DI-14-34-0001-2131)
(PB84-207349; RR-43; ORT-A-060-NH(1)) Avail: NTIS HC A08/MF A01 CSCL 13B

Six remote ponds and their watersheds in the White Mountains of New Hampshire were mapped, and chemical characteristics of the ponds and inlet streams were measured to estimate susceptibility to acid precipitation. The methods used and data collected during 1980-82 are included for possible comparisons with future studies or for alternative analyses and interpretations. Although the ponds are within a 20 km radius of each other and seemingly have similar watershed characteristics and precipitation chemistry, the volume-weighted pH between ponds ranged from 4.5 to 6.4. Volume-weighted alkalinity from 0 to 144 micro-eq/1. Each of the six ponds is unique and a broad approach at grouping them based only on one or two parameters is inadequate. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-11476 Miami Univ., Coral Gables, Fla.
LATE QUATERNARY GLACIAL CYCLES IN THE BAHAMIAN DEEP BASINS AND IN THE ADJACENT ATLANTIC OCEAN Ph.D. Thesis
Andre Willy Droxler 1984 186 p
Avail: Univ. Microfilms Order No. DA8416292

Late Quaternary sediments in the deep Bahamian basins and in the adjacent Atlantic Ocean, display well defined synchronous cyclic patterns in the aragonite, carbonate, quartz content and the composition of clays and feldspars. The aragonite cyclic variations closely match the oxygen isotope curve of the planktonic foraminifer Globigerinoides rubra, a worldwide record of recent ice ages. The widely accepted hypothesis that the aragonite cycles reflect primarily input variations caused by flooding and exposure of the banks during Quaternary sea level cycles is rejected. This rejection is based on the three following observations: (1) the newly discovered close match of aragonite cycles and oxygen isotope record, (2) the time lag of several thousand years between the increase of aragonite and bank flooding during the last deglaciation and (3) the high correlation between the aragonite record and the well established sequence of deglaciation events. Instead, aragonite dissolution cycles are proposed as the prime control of the cycles. They are shallow-water analogues of the calcite dissolution cycles in the deep Atlantic that are known to be tied to the glacial/interglacial changes in the water structure and circulation.
Dissert. Abstr.

N85-11477 Rice Univ., Houston, Tex.
PETROLOGY OF DEEP CRUSTAL XENOLITHS FROM THE EASTERN SNAKE RIVER PLAIN, IDAHO Ph.D. Thesis
David Joseph Matty 1984 284 p
Avail: Univ. Microfilms Order No. DA8416544

Xenoliths, collected from certain hybrid lava flows and vents at three localities in the eastern Snake River Plain region of southern Idaho, were derived from underlying crystal terrains which experienced granulite-facies metamorphism at approximately 3.0 AE. Lithologicaly, charnockite, opdalite, enderbite, and norite metaigneous xenoliths are predominent, but biotite-garnet gneiss and cognate noritic xenoliths derived from fractional crystallization of the host lavas also occur. The metamorphic charnockite-norite xenoliths are characterized by mineral assemblages containing compositionally homogeneous plagioclase + hypersthene + /-quartz +/-alkali feldspar +/-iron-titanium oxides +/-clinopyroxene +/-biotite. Iron-titanium oxide, two-feldspar, and two-pyroxene geothermometry calculations indicate that metamorphism of the xenoliths occurred at about 700 to 800 C. Corresponding pressures, estimated from garnet-plagioclase-orthopyroxene-quartz and plagioclase-clinopyroxene-quartz relationships, range from approximately 4 to 8 kbar. Dissert. Abstr.

N85-11478 California Univ., Santa Cruz.
A PALEOMAGNETIC STUDY OF THE PRINCE WILLIAM TERRANE AND NIXON FORK TERRANE, ALASKA Ph.D. Thesis
Peter William Plumley 1984 334 p
Avail: Univ. Microfilms Order No. DA8416246

The mean paleomagnetic inclination of Paleocene volcanics from two regions on Kodiak Island in the Ghost Rocks Formation suggests that the Prince William terrance originated at mid latitudes, about 25 deg south of its expected Alaskan latitude in Paleocene time. The mean declinations of the two regions, however, differ by approximately 120 deg, suggesting they have rotated with respect to each other, perhaps during emplacement. It is suggested that, despite the lack of evidence for a major Tertiary suture zone between the Prince William terrane and central Alaska, the Prince William and perhaps adjacent terranes may have lain substantially south of their present position in the early Tertiary. Paleomagnetic data from early Ordovician to early Tertiary rocks of the Nixon Fork terrane, central Alaska, provide evidence toward a better understanding of the tectonic evolution of the continental margin of northwestern America. The Nixon fork terrane, a Paleozoic continental margin assemblage, is bordered on the south by proven allochthonous terranes and to the North by provinces with oceanic affinities far younger in age. Paleomagnetic analysis of the Ordovician limestone sections (Lower Ordovician Novi Mountain and Middle to Upper Ordovican Telsitna Formation) are interpreted as having three components of magnetization. Dissert. Abstr.

N85-11479 Oregon State Univ., Corvallis.
A COMPARISON OF SEISMIC PROPERTIES OF YOUNG AND MATURE OCEANIC CRUST Ph.D. Thesis
Michel Bee 1984 196 p
Avail: Univ. Microfilms Order No. DA8415279

Seismic properties (p, S velocities and Poisson's ratio) of young (0.75 m.y.) and mature (110 m.y.) oceanic crust are obtained by studying explosive refraction data collected in the Pacific Ocean using ocean bottom and downhole seismometers. A comparison of the resuls for the two regions indicates that the upper crusta velocities increase with age due to the cementation of cracks and fractures, the upper mantle velocities increase with age due to cooling, and the crust (mainly the lower crust) thickens with age. The Poicson's ratios obtained are too small to be consistent with the presence of any serpentinization of the lower crust or upper mantle which therefore precludes upper mantle serpentinization as the cause for the thickening of the crust with age. When comparing seismic structures of young and mature oceanic crust with ophiolite models, close similarities were found between the Samail ophiolite and young oceanic crust, and between the Bay of Islands ophiolite and old oceanic crust. Dissert. Abstr.

N85-11480 Texas Univ., Dallas.
GENERALIZED LINEAR INVERSION OF 2.5 - DIMENSIONAL GRAVITY AND MAGNETIC ANOMALIES Ph.D. Thesis
Shang-Fei Lai 1984 211 p
Avail: Univ. Microfilms Order No. DA8416658

An iterative generalized linear inversion (GLI) routine based on a 2.5-dimensional model has been developed for interpretation of potential field data. The inversion process is accomplished by minimizing an objective function that expresses the mean square error between observational data and theoretical values of the resultant model. All problems treated are simultaneously underdetermined and overconstrained. Thus unacceptably high variance of model parameters may occur, if one intends to fit the observation data as precisely as possible. Statistical analysis emphasizing an influence of data errors, magnitude of eigenvalue, and accuracy of eigenvectors has been made in order that an optimum inverse can be constructed. The inversion routine is designed to solve the geometrical shape of the subsurface structures only, so the density/susceptibility contrast is assumed to be known. To understand the significant features of the solutions solved by this technique a series of tests have been performed. Also developed is the nonlinear inversion technique in which the quadratic terms of the Taylor series expansion of forward formulae are involved in the inversion procedure. Dissert. Abstr.

N85-11481 Indiana State Univ., Terre Haute.
PALEOHYDROLOGY AND GEOMORPHOLOGY OF SELECTED REACHES OF THE UPPER WABASH VALLEY, INDIANA Ph.D. Thesis
Danny M. Vaughn 1984 225 p
Avail: Univ. Microfilms Order No. DA8416437

By 14,370 years B.P. glacial Lake Maumee was forming from meltwater of the Erie glacial lobe. The lake rose to an elevation of 244 meters (800 feet) before breaching a southwest trending, curvilinear recessional moraine at Fort Wayne, Indiana. Meltwater drained into the Upper Wabash Valley exceeding bankfull stage. It is the hypothesis that the erosional and depositional features which remain preserved today can be used to calculate the hydraulic conditions of the flood and thereby establish a quantitative reconstruction of the paleohydrology of selected reaches of the

valley. Long, linear valley tracts, truncated interfluxes, ponding, hanging tributary valleys, reworked terraces, longitudinal bars, pendant bars, expansion bars, rock defended terraces, cobble and boulder fields suspended as much as 24 meters (80 feet) above the present valley floor, current dunes, and channel braids suggest a catastrophic fluvial genesis. Dissert. Abstr.

N85-11482 Miami Univ., Coral Gables, Fla.
SUBMARINE SAND RIDGES: GEOLOGY AND DEVELOPMENT, NEW JERSEY, USA Ph.D. Thesis
Alberto Garcia deGigueiredo, Jr. 1984 459 p
Avail: Univ. Microfilms Order No. DA8416295

Four areas with submarine sand ridges are studied on the New Jersey continental shelf. Two areas located on the nearshore, one on the mid-shelf and one on the outer shelf are studied through extensive use of high resolution seismic and vibracores. Despite their different orientations, the nearshore and the mid-shelf ridges are believed to have similar origins. The ridges and underlying strata are subdivided into seismic units of distinct character. It is hypothesized that the nearshore submarine sand ridges begin forming at inlets and develop as sea level rises and shoreface retreats. The closing of inlets does not halt ridge development. The process of formation of the mid-shelf ridges is considered to be a variation of that of the nearshore ridges. It is suggested that the mid-shelf ridges are formed sub-parallel to the shore because of the large offset of the inlet downdrift margin. Dissert. Abstr.

N85-11483 Alaska Univ., Fairbanks.
ELECTRIC CONDUCTIVITIES, CURRENTS AND ENERGY DISSIPATION IN THE POLAR IONOSPHERE Ph.D. Thesis
Byung-Ho Ahn 1983 222 p
Avail: Univ. Microfilms Order No. DA8416223

During the International Magnetospheric Study (IMS), magnetic records from the six IMS meridian chain stations were obtained. Furthermore, several advanced computer codes calculating ionospheric current distributions based on the ground magnetic data were recently introduced. Combining the data set and the computer code developed by Kamide et al. (1981), it is attempted to re-examine the longstanding uncertainties in the current distributions and the energy dissipation rates in the polar ionosphere during substorms. For this purpose, a conductivity model which can reflect substorm conditions on an instantaneous basis was obtained based on the empirical relations of the north-south component (delta H) of the magnetic disturbance field observed at College, with the Pedersen and Hall conductivities deduced from Chatanika radar observations. In addition, the relationship of the particle energy injection rate to delta H is also established. The ionospheric current distributions of 5-minute time resolution are obtained. Several interesting features in the current distributions during each phase of substorm are discussed. Furthermore, a new ionospheric current model during a substorm is schematically suggested. The IMPF effects on the current patterns are also discussed. Dissert. Abstr.

N85-11484 Oregon State Univ., Corvallis.
QUASI-STATIONARY ATMOSPHERIC RESPONSES TO LARGE-SCALE FORCING Ph.D. Thesis
In-Sik Kang 1984 154 p
Avail: Univ. Microfilms Order No. DA8415289

A time-dependent, spectral, barotropic model and a similar two-layer primitive equation model are developed to investigate the planetary-scale wave responses to various types of large-scale forcing: vorticity and heat sources, and sea surface temperature (SST) anomalies. Both models are linearized about the zonal mean states of January climatology. The characteristics of forced Rossby waves are extensively studied based on both the barotropic model experiments and the theory of Rossby wave propagation on the sphere. In particular, both model and theoretical results show that the responses are dominated by ultra-long wave components, and that the large responses occur for vorticity sources located at the subtropics and at the high latitudes near 45 N. The model experiments for the wavenumber-dependent sources located at various latitudes show that the ultralong waves behave like a north-south seesaw. A series of baroclinic model experiments, in which surface heat fluxes and internal heating are computed in terms of the model variables, are conducted to investigate the linear effect of sea surface temperature anomalies on the atmospheric circulation. Dissert. Abstr.

N85-11485 Miami Univ., Coral Gables, Fla.
A COMPARISON OF 2- AND 3-DIMENSIONAL TRANSPORT WITHIN A STRATOSPHEREIC CIRCULATION MODEL Ph.D. Thesis
Hans-Rainer Schneider 1984 204 p
Avail: Univ. Microfilms Order No. DA8416316

The use of the residual circulation for tracer transport in the stratosphere is compared to an exact three-dimensional transport calculation. To obtain the wind fields for this comparison, a mechanistic primitive model for the stratospheric circulation was formulated. The model is semispectral, uses a split explicit time integration scheme and includes wave-wave interaction. Also, a numerical transport scheme, called the square root scheme, was developed. This scheme avoids the problem of negative mixing ratios, has very little inherent diffusion and good shape preserving properties, and it is computationally simple, even in three spatial dimensions. Transport comparisons were made for two cases: a modeled linear m = 1 warming and a perpetual January run without a major warming. A passive tracer was tranported for both cases, using once the three-dimensional velocity fields and again, using the residual circulation, diagnosed from the same runs. For the January case, the evolution of the mixing ratios of an ozone-like tracer was also studied. It is confirmed that the residual circulation gives poor results during a major stratospheric warming. The residual circulation also does not properly treat the southward and upward mixing which occurs in subtropical latitude. Dissert. Abstr.

N85-11486 Rice Univ., Houston, Tex.
PALEOENVIRONMENTAL INTERPRETATION OF THE UPPER CRETACEOUS POINT LOOKOUT SANDSTONE: IMPLICATIONS FOR SHORELINE PROGRADATION AND BASIN TECTONIC HISTORY, SAN JUAN BASIN, NEW MEXICO Ph.D. Thesis
Robyn Wright 1984 447 p
Avail: Univ. Microfilms Order No. DA8416574

Detailed stratigraphic and sedimentologic study of outcrop exposures of the Pt. Lookout Fm. and adjacent Mancos and Menefee Fms. of the southeastern San Juan Basin served as the basis of research, whose objectives were to (1) document the small scale facies patterns within the nearshore marine Pt. Lookout Sandstone, (2) relate sediment textural characteristics to corresponding environments of deposition, and (3) define factors influencing propagation of the NW-SE trending Pt. Lookout strandline. The distribution of facies reflects interaction of relatively low wave energy, moderate tidal strength, and locally moderate fluvial input along the studied portion of the ancient coastline. Combination of these processes resulted in development of a low wave-energy mainland beach separating an extensive tidal creek complex from the open marine. Where tidal creeks experienced fluvial connection, a dip-aligned delta prograded. Dissert. Abstr.

N85-11487 Rice Univ., Houston, Tex.
THE PETROLOGY AND GEOCHEMISTRY OF HIGH CASCADE VOLCANICS IN SOUTHERN WASHINGTON: MOUNT SAINT HELENS VOLCANO AND THE INDIAN HEAVEN BASALT FIELD Ph.D. Thesis
Diane Ruth Smith 1984 423 p
Avail: Univ. Microfilms Order No. DA8416561

Mount St. Helens volcano (Washington, USA) was characterized by four eruptive periods during the last 2200 years. Eruptive products include a wide spectrum of rock types including basaltic to andesitic lavas, andesitic to dacitic pyroclastic flows and tephra, and dacite domes. The major and trace element compositions of some andesites and dacites are broadly consistent with their derivation from a basaltic andesite parental magma by fractional crystallization processes involving the observed phen-

ocryst assemblages. However, the strontium and oxygen isotopic compositions of representative samples of the Mount St. Helens suite indicate that closed system processes cannot explain the isotopic variations. The isotopic ratios are positively correlated with one another and with bulk composition (SiO2, Mg number, etc.). The isotopic variations and trace element data support an origin of some intermediate and silicic rock types by combined processes of assimilation and fractional crystallization. Dissert. Abstr.

N85-11488*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
IMPACT CRATERING: THE PROCESS AND ITS EFFECTS ON PLANETARY EVOLUTION Final Report, Feb. 1983 - Sep. 1984
Richard A. F. Grieve Sep. 1984 5 p
(Grant NAGw-454)
(NASA-CR-174016; NAS 1.26:174016) Avail: NTIS HC A02/MF A01 CSCL 08G

The potential for silicate-carbon dioxide reactions as a geochemical weathering agent on Venus was studied. A tholeitic basalt close to the composition determined by the XRF experiment at the Venera 14 sites was subjected to high temperature and pressure (with pure CO2 as the pressure medium) for varying time durations. The starting basalt material and the run products were examined optically and by X-ray diffraction and electron microscopy. The kinetics of the silicate-carbonate reactions is discussed. A study to elucidate details of impact processes and to assess the effects of impact cratering on planetary evolution is mentioned. R.S.F.

N85-11489*# Institute for Atmospheric Optics and Remote Sensing, Hampton, Va.
DEVELOPMENT OF A GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO2 WAVELENGTHS Monthly Progress Report, 14 Oct. - 13 Nov. 1984
Jun. 1984 6 p
(Contract NAS8-35594)
(NASA-CR-174053; NAS 1.26:174053) Avail: NTIS HC A02/MF A01 CSCL 04A

Work on the following tasks is reported briefly: (1) to investigate the effect of aerosol microphysical processes, occurring in an aerosol plume which undergoes transport in the atmosphere, on its beta sub CO2 value and (2) to examine experimentally measured size distributions for the free troposphere, fit bimodal log-normal models with different retractive indices for the two modes, and calculate beta sub CO2. R.S.F.

N85-11490*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
BASIC RESEARCH FOR THE GEODYNAMICS PROGRAM Semiannual Status Report, Apr. - Sep. 1984
Oct. 1984 35 p refs
(Grant NsG-5265)
(NASA-CR-174055; NAS 1.26:174055; SASR-13) Avail: NTIS HC A03/MF A01 CSCL 08G

Some objectives of this geodynamic program are: (1) optimal utilization of laser and VLBI observations as reference frames for geodynamics, (2) utilization of range difference observations in geodynamics, and (3) estimation techniques in crustal deformation analysis. The determination of Earth rotation parameters from different space geodetic systems is studied. Also reported on is the utilization of simultaneous laser range differences for the determination of baseline variation. An algorithm for the analysis of regional or local crustal deformation measurements is proposed along with other techniques and testing procedures. Some results of the reference from comparisons in terms of the pole coordinates from different techniques are presented. E.R.

N85-11491# Geological Survey, Washington, D.C.
VERTICAL CRUSTAL MOVEMENTS IN SOUTHERN CALIFORNIA, 1974 TO 1978
Robert O. Burford and Thomas D. Gilmore 1984 26 p refs
(GS-Circ-905; LC-84-601023) Avail: NTIS HC A03/MF A01

An extensive resurvey of most of the first-order leveling network in southern California, known as the Southern California Releveling Program (SCRP), was carried out during the first 5 months of 1978. The primary scientific purpose of these measurements was to rapidly update the vertical control record throughout a recently uplifted region of southern California in order to more thoroughly document the vertical component of tectonic movement and to provide a reliable base for comparison with future levelings. Analyses of historic first-order leveling results have clearly demonstrated that a broad crustal upwarping, largely contained within a region consisting of the Transverse Ranges province and an area along the intervening section of the San Andreas fault system, had developed between about 1959 and 1974. Unfortunately, there is strong evidence that parts of the 1978 SCRP data are contaminated by the effects of intrasurvey tectonic deformation, limited surficial failures, and, less certainly, magnetically induced systematic error associated with the use of automatic levels. However, any distortions in leveling results caused by these or other factors are not so serious as to render the SCRP data useless. B.W.

N85-11492*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE PROPAGATION AND GROWTH OF WHISTLER MODE WAVES GENERATED BY ELECTRON BEAMS IN EARTH'S BOW SHOCK Progress Report
R. L. Tokar and D. A. Gurnett Apr. 1984 50 p
(Contract NAS5-26819; Grant NGL-16-001-043; Contract N00014-76-C-0016)
(AD-A145572; U-OF-IOWA-84-12) Avail: NTIS HC A03/MF A01 CSCL 04/1

In this study, the propagation and growth of whistler mode waves generated by electron beams within Earth's bow shock is investigated using a planar model for the bow shock and a model electron distribution function. Within the shock, the model electron distribution function possesses a field-aligned T $>$ T beam that is directed toward the magnetosheath. Waves with frequencies between about 1 and 100 Hz with a wide range of wave normal angles are generated by the beam via Landau and anomalous cyclotron resonances. However, because the growth rate is small and because the wave packets traverse the shock quickly, these waves do not attain large amplitudes. Waves with frequencies between about 30 and 150 Hz with a wide range of wave normal angles are generated by the beam via the normal cyclotron resonance. The ray paths for most of these waves are directed toward the solar wind although some wave packets, due to plasma convection travel transverse to the shock normal. These wave packets grow to large amplitudes because they spend a long time in the growth region. The results suggest that whistler mode noise within the shock should increase in amplitude with increasing upstream theta sub Bn. The study provides an explanation for the origin of much of the whistler mode turbulence observed at the bow shock. GRA

N85-11493# Tennessee Univ., Knoxville.
PLANE WAVE (EMP) INCIDENCE ON A FINITELY CONDUCTING PLANE EARTH WITH THE MAGNETIC FIELD INTENSITY PARALLEL TO THE EARTH'S SURFACE
H. P. Neff, Jr. and D. A. Reed 8 Feb. 1984 44 p refs
(Contract DE-AC05-84OR-21400)
(DE84-015364; DOE/OR-21400/T37) Avail: NTIS HC A03/MF A01

The effect of the Earth's conductivity and permittivity, along with angle of arrival of the incident plane wave, on the reflected wave are examined. Time domain results are obtained for both a unit step incident field and a double ponential incident field. Results show that for angles less than the Brewster angle it is possible for the composite field to be larger than the incident field. DOE

N85-11494# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
SOIL TILT MEASUREMENT: FIRST RESULTS OF THE COMPARATIVE ANALYSIS OF THE RESPONSE OF TWO DIFFERENT TILTMETERS [MISURE DI INCLINAZIONE DEL SUOLO: PRIMO RISULTATI DELL'ANALISI COMPARATA DELLE RISPOSTE

OTTENUTE DA DUE DIVERSI INCLINOMETRI]
P. F. Biagi, P. Palangio (Ist. Nazionale di Geofisica, l'Aquila, Italy), S. Sciarratta (l'Aquila Univ., Italy), and V. Sgrigna 18 Jan. 1984 28 p refs In ITALIAN
(Nota-Interna-818) Avail: NTIS HC A03/MF A01

A pendulum tiltmeter and a bubble type tiltmeter, both with a sensitivity of 0.001 microrad, are described. Comparisons of the instruments exposed to the same Earth crust angular displacements show a qualitative similarity, while the pendulum tiltmeter presents an amplification of at least twice that of the bubble tiltmeter. An analysis of the optimization of the pendulum tiltmeter design is presented. Author (ESA)

N85-11495# Research Inst. of National Defence, Stockholm (Sweden). Div. of of Applied Seismology.
SEISMOLOGY 1983: NUCLEAR TEST BAN VERIFICATION, EARTHQUAKE AND EARTH RESOURCE INVESTIGATION Progress Report, 1983
May 1984 91 p refs Original contains color illustrations
(FOA-C-20537-T1) Avail: NTIS HC A05/MF A01

Dectection seismology, local seismicity in Sweden, and seismic exploration are discussed. In 1983, China exploded 1 nuclear device, France 7, the United Kingdom 1, the United States 15, and the Soviet Union 27. All explosions were underground, and below the 150 kton limit. The development of international data centers for seismic discrimination and nuclear explosion monitoring; seismic risk estimation at nuclear power plants; and seismic cross hole measurement investigation of crystalline rock are treated. Author (ESA)

N85-11496# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
A PILOT STUDY OF FUTURE RESEARCH ON SEISMIC HAZARDS IN SWEDEN
Ragnar Slunga Jul. 1984 56 p refs In SWEDISH; ENGLISH summary Sponsored by Swedish Nuclear Power Inspectorate and Swedish Board for Spent Nuclear Fuel
(FOA-C-20544-T1; ISSN-0347-3694) Avail: NTIS HC A04/MF A01

Seismic measurement programs (especially shallow events) in Sweden for siting nuclear power plants and nuclear waste disposal facilities are proposed. Acquisition of data on geological faults; development of geophysical/mechanical models for a quantitative analysis of crustal deformations and stresses; aftershock measurements in the epicentral area of very shallow earthquakes for understanding of the shallow faulting process; and estimation of ground motions from instrumental observations and from theoretical computations are discussed. Author (ESA)

N85-11497# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ROCKET AND SATELLITE OBSERVATIONS OF ELECTRIC FIELDS AND ION CONVECTION IN THE DAYSIDE AURORAL IONOSPHERE
G. Marklund and R. A. Heelis ((Texas Univ., Dallas) Jun. 1984 33 p refs Sponsored by Swedish Board of Space Activities
(Grants NAG5-306; AFGL-F19628-83-K-0022)
(TRITA-EPP-84-05; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

Electric field observations from two high-altitude rocket flights in the polar cusp were combined with satellite observations of ion drifts to infer details of the electric field and convection pattern of the dayside auroral ionosphere. A region of shear flow reversal can be inferred from the electric field observations on one flight. Drift patterns observed by the spacecraft are very similar although shifted by 0.5 deg, a shift expected from the observed change in the interplanetary magnetic field Bz component. A region of rotational flow reversal was observed shortly after magnetic noon, at the same time the satellite travelled along the dawn-dusk meridian. By joining points of equal potential, integrated from the two data sets, and assuming the reversal boundary to be an equipotential, the instantaneous convection pattern was drawn, showing crescent-shaped convection contours in the dusk cell and circular contours in the dawn cell. Author (ESA)

N85-11086# Joint Publications Research Service, Arlington, Va.
CONVECTION OF PLASMA IN POLAR IONOSPHERE, COMPARISON OF MEASUREMENTS FROM COSMOS-184 WITH MODEL DEPENDENT ON INTERPLANETARY MAGNETIC FIELD VECTOR Abstract Only
B. A. Belov, Yu. I. Galperin, L. V. Zinin, A. Ye. Levitin, R. G. Afonina, and Ya. I. Feldshteyn *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 63 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 201-212 Original language doc. was announced as A84-34082 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11087# Joint Publications Research Service, Arlington, Va.
EQUATORIAL ENERGETIC DISTRIBUTIONS OF IONS OF TERRESTRIAL RADIATION BELT AS FUNCTION OF SOLAR CORONA TEMPERATURE RESPONSE Abstract Only
N. A. Vlasova and M. I. Panasyuk *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 64 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 213-224 Original language doc. was announced as A84-34083 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11089# Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF CHARGED PARTICLES IN LOWER IONOSPHERE WITH ACOUSTICAL EFFECTS Abstract Only
I. A. Devyaterikov, Ye. A. Ivanov, S. I. Koslov, and V. P. Kudryavtsev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 65 Transl. into ENGLISH from Kosmicheskiye Issled (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 238-242 Original language doc. was announced as A84-34085 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11091# Joint Publications Research Service, Arlington, Va.
MODEL OF ATMOSPHERIC OZONE FOR MIDDLE LATITUDES Abstract Only
V. S. Komarov and A. A. Mitsel *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 66 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 306-309 Original language doc. was announced as A84-34093 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11108# Joint Publications Research Service, Arlington, Va.
ENERGY-ACTIVE ZONES IN NORTH ATLANTIC AS MANIFESTATION OF INTERANNUAL VARIABILITY OF RADIATION BALANCE Abstract Only
G. I. Marchuk, Ya. Kondratyev, and V. V. Kozoderov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 99 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 3-15 Original language document announced as A84-28683 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11109# Joint Publications Research Service, Arlington, Va.
SOME STATISTICAL CHARACTERISTICS OF ATMOSPHERIC OPTICAL THICKNESS IN VISIBLE SPECTRAL RANGE Abstract Only
Sh. A. Akhmedov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 100 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 33-37 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11110# Joint Publications Research Service, Arlington, Va.
SEISMOTECTONIC NATURE OF SOME ANNULAR PHOTOANOMALIES REGISTERED BY REMOTE METHODS Abstract Only
V. I. Popkov *In its* USSR Rept.: Space (JPRS-USP-84-005)

26 Oct. 1984 p 101 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 38-40 Original language document announced as A84-28687 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11111# Joint Publications Research Service, Arlington, Va.
PREDICTING FRACTURING ZONES IN CASPIAN DEPRESSION SUBSALT DEPOSITS ON BASIS OF SPACE INFORMATION AND GEOLOGICAL-GEOPHYSICAL DATA Abstract Only
I. N. Kapustin and S. Ye. Petrov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 101-102 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 1, Jan. - Feb. 1984 p 41-50 Original language document announced as A84-28688 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11723# Joint Publications Research Service, Arlington, Va.
LABORATORY INVESTIGATION OF COEFFICIENTS OF ABSORPTION OF AIR AT LAMBDA = 10.6 MICRONS Abstract Only
Yu. G. Toporkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 86 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 599-604 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-11498 Rice Univ., Houston, Tex.
A STUDY OF GREENHOUSE EFFECTS USING ZERO, 1 AND 2 DIMENSIONAL CLIMATE MODELS Ph.D. Thesis
Hasan Nuzhet Dalfes 1984 64 p
Avail: Univ. Microfilms Order No. DA8416513

A hierarchy of simple climate models is built and used to assess the impact of changes in the trace gas abundance of Earth's atmosphere on the global and zonal surface temperatures. Two of the four models presented use the Equivalent Radiative Atmosphere approximation to treat the greenhouse effect of water vapor, carbon dioxide and ozone. The other two models have vertically resolved atmospheres and use broad band absorptance and emissivity models in the treatment of radiative exchanges. Two of the models have resolution in the meridional direction and the horizontal energy transport is approximated by a linear, constant coefficient diffusion. A series of sensitivity experiments is conducted with these moels to assess the relative importance of various parameters and modeling assumptions. Another series of calculations is concerned with the impact of changes in the CO2 abundance of the atmosphere on the surface temperatures. The effect of minor trace gases)3, CH4 and N2O on the globally averaged temperature is also studied. Dissert. Abstr.

N85-11499 Alaska Univ., Fairbanks.
ARCTIC HAZE: METEOROLOGICAL ASPECTS OF LONG-RANGE TRANSPORT Ph.D. Thesis.
Wolfgang Eduard Raatz 1983 232 p
Avail: Univ. Microfilms Order No. DA8416225

A time series of concentrations of pollution aerosols collected over a period of four years in the near-surface air at Barrow, Alaska, was used to investigate tropospheric long-range transport of anthropogenic pollution from mid-latitudes into the Arctic. This transport takes place when the mid-latitudinal and arctic atmospheric circulations remain in a quasi-persistent mode. Sudden changes in the circulation pattern explain the episodic character of the arctic pollution aerosol. Transport of aerosols is accomplished by quasi-stationary anticyclones and takes place along their peripheries where pressure gradients are relatively strong. The seasonal variation in concentration of the arctic pollution aerosol is explained by the seasonal variation in the occurrence and position of mid-latitude blocking anticyclones, of the arctic anticyclone, and of the Asiatic anticyclone. A second data set, collected during the Ptarmigan weather reconnaissance flights, was investigated for observations of Arctic Haze over the Alaskan Arctic. A connection between Arctic Haze and the arctic pollution aerosols is suggested. Dissert. Abstr.

N85-11500*# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
THEORETICAL DEVELOPMENT OF MONTE CARLO CODES FOR MODELING CUMULUS CLOUD FIELDS Final Report
Ronald M. Welch Oct. 1984 61 p refs
(Grant NAG1-307)
(NASA-CR-174063; NAS 1.26:174063; Rept-84-3) Avail: NTIS HC A04/MF A01 CSCL 04B

Reflected fluxes are calculated for stratocumulus cloud fields as a function of skycover, cloud aspect ratio, and cloud shape. Cloud liquid water volume is held invariant as cloud shape is varied so that the results can be utilized more effectively by general circulation models and climate models. On the basis of required accuracy in the Earth Radiation Budget Experiment program, an order of magnitude value of 10 W/sq m is used to estimate significant differences between plane parallel and broken cloudiness. This limit is exceeded for cloud covers between 10% and 90%, indicating that plane paralel calculations are not satisfactory at most values of cloud cover. The choice of cloud shape also leads to large differences in reflected fluxes. These differences are traced to the anisotropic intensity pattern out the cloud sides, to the size and shape of the holes between clouds, and to variations in cloud area as viewed from the solar direction. An empirical relationship for effective cloud cover is given at solar zenith angle of theta = 60 deg. This relationship allows for the relatively accurate (delta F = 10 - 15 W/sq m.) computation of broken cloud field reflected fluxes from plane parallel calculations. Author

N85-11501# National Center for Atmospheric Research, Boulder, Colo. Joint Airport Weather Studies Project.
MICROBURST WIND STRUCTURE AND EVALUATION OF DOPPLER RADAR FOR WIND SHEAR DETECTION Final Report
James W. Wilson, Cathy Kessinger, Rita D. Roberts, and John McCarthy Washington FAA Oct. 1984 43 p refs
(Contract DTFA01-82-Y-10513)
(DOT/FAA/PM-84/29) Avail: NTIS HC A03/MF A01

Doppler weather radar data from the Joint Airport Weather Studies Project are used to determine the horizontal and vertical structure of airflow within microbursts. Typically, the associated downdraft is about 1 km wide and begins to spread horizontally at a high below 1 km. The median time is 5 min from initial divergence at the surface to maximum differential wind velocity across the microburst. The height of maximum differential velocity is 75 m. The median velocity differential is 22 m/sec over an average distance of 3.1 km. The outflow is assymetric, averaging twice as strong along the maximum shear axis compared to the minimum axis. Doppler radar could be an effective means for identifying microbursts and warning aircraft of wind shear hazards. For microburst detection such radar must be able to measure wind velocities in clear air as well as heavy rain and hail. Scan update rates should be approximately every 2 min and the lowest few hundred meters of the atmosphere must be observed. Ground clutter must be considerably reduced from levels typically obtained with present Doppler radars. R.S.F.

N85-11502# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FORECAST OF THE NORTHEASTERN DROUGHT BY THE METHOD OF PERIODICITIES: USE AND ABUSES [PREVISAO DE SECAS NO NORDESTE PELO METODO DAS PERIODICIDADES: USO E ABUSOS]
Carlos Afonso Nobre, Horacio H. Yanasse, and Corina C. F. Yanasse May 1984 19 p refs In PORTUGUESE; ENGLISH summary
(INPE-3109-PRE/508) Avail: NTIS HC A02/MF A01

Statistical analysis of Fortaleza, Ceara, Brazil rainfall series is

presented (1849 to 1978). Several tests for white noise showed that the series is not uncorrelated at 95% confidence level. Periodicities of approximately 13 and 26 yeas were found to be statistically significant. A forecasting model based on these periodicities was built. It is seen that the two periodicities explained only 24% of the series' variance. Several limitations of such a forecasting model are discussed. It is concluded that the uncertainties involved in drought forecasting in northeastern Brazil based on this model are high. Therefore it is recommended that these drought forecasts be viewed with great care. Author

N85-11503# New Zealand Meteorological Service, Wellington.
STATISTICAL INTERPRETATION OF NWP MODEL OUTPUT: AN OVERVIEW OF TECHNIQUES USED AND RESULTS ACHIEVED
Neil D. Gordon 4 Jan. 1984 9 p refs Repr. from Proc. of Asia and South West Pacific Tech. Conf. on Operational Weather Forecasting Including Interpretation of Numerical Weather Prediction Output (Beijing), 1983 p 122-128 Conf. held in Beijing, 24-28 Oct. 1983
(Rept-551.509.313; ISSN-0112-2398; SR-2) Avail: NTIS HC A02/MF A01

The statistical interpretation of Numerical Weather Prediction (MWP) models is investigated. These models provide synoptic scale prognoses of the surface and upper air pressure and flow fields similar to those formerly produced manually. They also provide predictions of such useful fields as moisture and vertical motion. To obtain guidance for local weather forecasts, the NWP output must be interpreted in some fashion. This interpretation is based on statistics relating required weather elements to the synoptic scale predicted fields. M.A.C.

N85-11504# World Climate Programme, Geneva (Switzerland).
REPORT OF THE THIRD SESSION OF THE INTERNATIONAL WORKING GROUP ON DATA MANAGEMENT FOR THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)
1984 61 p refs Conf. held in Tokyo, 6-8 Mar. 1984
(WCP-82) Avail: NTIS MF A01; print copy available at WMO, Geneva

Algorithms for the modeling of the radiative proprties of clouds are examined. The coordination of regional and global data collection centers is also investigated. A comparison is made between satellite data and modeled radiance information to improve the accuracy of the climate models. Emphasis is also placed on data management and information dissemination. M.A.C.

N85-11505# World Climate Programme, Geneva (Switzerland).
BIBLIOGRAPHY OF CLIMATE TEXTBOOKS AND STUDIES
Malcolm Rigby 1984 182 p
(WCP-84) Avail: NTIS MF A01; print copy available at WMO, Geneva

This bibliography contains 1171 references to climate textbooks, atlases, reviews, and handbooks. Most references were published after 1950. Among the major fields included in this bibliography are: aeronautical meteorology and climatology, agricultural meteorology and climatology, air pollution meteorology and climatology, bioclimatology, hydrometeorology, marine meteorology and climatology, micrometeorology and microclimatology, oceanography, paleoclimatology, and synoptic meteorology. R.S.F.

N85-11506# Army Missile Command, Redstone Arsenal, Ala.
JOINT PROBABILITY OF SELECTED CLOUD AND VISIBILITY THRESHOLDS AROUND KOBLENZ, GERMANY
L. J. Levitt and O. M. Essenwanger Mar. 1984 84 p
(AD-A145294; AD-E950547; DRSMI/RR-84-3-TR) Avail: NTIS HC A05/MF A01 CSCL 04/2

The areal probabilities of adverse weather at a station network consisting of Cologne, Frankfurt, Hahn, and Bitburg have been determined for the period of record 1961 through 1970 (except September 1967 through August 1968). Individual and joint probabilities of adverse weather for eight categories of ceiling and visibility observations defined in a previous report (see reference 1) have been tabulated. The 9-year period was chosen due to a large amount of missing data at Cologne during the months indicated above. The identical set of tabulations for the complete 10-year period without Cologne did not reveal any notable differences in the probabilities. The extensive set of tables reflects a selected number of adverse weather conditions. The reduction in joint probability estimates with increased areal coverage is evident for all adverse weather categories. Tabulations of probability estimates at each individual station and joint probability estimates of adverse weather are listed in annual, seasonal, and monthly summaries (selected months only). Author (GRA)

N85-11507# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE ARC CLOUD COMPLEX: A CASE STUDY M.S. Thesis
R. L. Miller Aug. 1984 116 p
(AD-A145384; AFIT/CI/NR-84-52T) Avail: NTIS HC A06/MF A01 CSCL 04/2

A detailed investigation of an arc cloud complex (ACC) using satellite, radar, rawinsonde, surface, and hourly precipitation data is documented. The fields of divergence and equivalent potential temperature were numerically determined. The ACC was produced by a mesoscale convective system (MCS) which was associated with a mid-tropospheric short-wave trough. The wind field at the surface within the ACC was highly divergent. It was deduced that the origin of the low-level air within the ACC was near the 700 mb level and that the origin of the updraft air was from a southerly low-level jet across West Texas. The edge of the ACC was characterized by strong wind shear. The precipitation structure of and behind the gust front while it was under the MCS cloud shield as similar to that in tropical convective systems. Convection which developed along the arc cloud become more intense than the convection which produced the arc cloud, and resulted in the formation of a larger, more significant MCS. GRA

N85-11508# Air Force Geophysics Lab., Hanscom AFB, Mass.
NORTHERN HEMISPHERE ATLAS OF 1-MINUTE RAINFALL RATES Air Force Surveys in Geophysics
P. Tattelman and D. D. Grantham 4 Oct. 1983 84 p
(AD-A145411; AFGL-TR-83-0267; AFGL-AFSG-444) Avail: NTIS HC A05/MF A01 CSCL 04/2

A model for estimating 1-min rainfall rates at a location for which routine climatic data are available was used to produce this atlas. Even though data were available for 3631 locations, considerable subjectivity and smoothing of the analyses were required because of the low station-density outside of North America and Europe. Northern Hemisphere analyses of rainfall rates equalled or exceeded 0.01, 0.05, 0.10, 0.50, and 1.0 percent of the time are presented for four mid-season months. Analyses of the highest rainfall rates for the same frequencies of occurrence regardless of the month in which they occur and companion analyses of the month in which the highest rate occurs are also presented. GRA

N85-11509# Air Force Geophysics Lab., Hanscom AFB, Mass.
SOUTHERN HEMISPHERE ATLAS OF 1-MINUTE RAINFALL RATES Air Force Surveys in Geophysics
P. Tattelman and D. D. Grantham 21 Oct. 1983 84 p
(AD-A145421; AFGL-TR-83-0285; AFGL-AFSG-443) Avail: NTIS HC A05/MF A01 CSCL 04/2

A model for estimating 1-min rainfall rates at a location for which routine climatic data are available was used to produce this atlas. Even though data were available for 483 locations, considerable subjectivity and smoothing of the analyses was required because of the low station-density in most areas. Southern Hemisphere analyses of rainfall rates equalled of exceeded 0.01, 0.05, 0.10, 0.50, and 1.0 percent of the time are presented for four mid-season months. Analyses of the highest rainfall rates for the same frequencies of occurrence regardless of the month in which they occur and companion analyses of the month in which the highest rate occurs are also presented. Author (GRA)

N85-11510# Naval Postgraduate School, Monterey, Calif.
EVALUATION OF AN AEROSOL PREDICTION MODEL FOR

COASTAL REGIONS USING MARINE AEROSOL GENERATION AND TRANSPORT DATA M.S. Thesis
D. J. Saunders Mar. 1984 69 p
(AD-A145443) Avail: NTIS HC A04/MF A01 CSCL 04/2

A mixed layer dynamic models for the structure and evolution of aerosols in a marine regime is presented. The aerosol spectrum is divided into continental and marine components, with a constant vertical continental profile assumed; both in and above the mixed layer. The aerosol spectrum is transformed into a reference relative humidity of 80%. The temporal evolution of the aerosol spectrum is predicted from rate equations which require a specification of the surface production rate, the entrainment rate and the mixed layer depth. The model was tested against the data set obtained in the Monterey Bay during the MAGAT 80 experiment. The model was initialized with both observed MAGAT data and an equilibrium initial value, gathered from the JASIN Experiment. The model was run for radii equal to 0.8, 2.0, 5.0 and 10.0 microns. The significance between the observed initial values and the JASIN data is that the MAGAT data was observed from the same air mass as the initial atmospheric data and verification aerosol data. The JASIN initial aerosol data is based on an equilibrium state as a function of only wind speed and reference relative humidity. The model continuously generated a correct gain or loss of aerosol concentrations as defined by the observed MAGAT data, and in most cases the model output is within one order of magnitude of the observed values. GRA

N85-11511# Texas Univ., El Paso. Dept. of Electrical Engineering.
CHARACTERIZATION OF ATMOSPHERIC CONDITIONS ALONG TRANSMISSION PATHS FROM A REMOTELY PILOTED VEHICLE Final Report, 22 Sep. 1980 - 21 Dec. 1983
C. McDonald, M. Izquierdo, H. N. Ballard, J. Smith, and F. Quintana
15 Feb. 1984 54 p
(Contract DAAG29-80-K-0091)
(AD-A145527; FRI-84-AR-140; ARO-17511.1-GS) Avail: NTIS HC A04/MF A01 CSCL 04/2

A remotely piloted vehicle (RPV), designated as the Maneuverable Atmospheric Probe (MAP), was instrumented for characterizing and mapping of the optical scattering properties of the atmosphere. This was accomplished by incorporating on the MAP a light and compact forward-scattering nephelometer for performing in situ measurements of the total scattering coefficients from approximately .03/km to 300/km, corresponding to visibilities of 100 km and 10 m, respectively. The MAP is also instrumented to perform atmospheric measurements of pressure, temperature, relative humidity, temperature and optical structure functions and particulate sampling. Based on theoretical as well as actual flight tests, it is concluded that the MAP may be used to completely characterize the optical scattering and refracting properties of the atmosphere resulting from its aerosol, turbulent, and temperature structure. GRA

N85-11512# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A CASE STUDY OF A CONVECTIVE OUTBREAK USING VAS-DERIVED THERMODYNAMIC PARAMETERS M.S. Thesis
M. F. Remeika 1984 94 p
(AD-A145560; AFIT/CI/NR-84-37T) Avail: NTIS HC A05/MF A01 CSCL 04/2

Soundings of atmospheric thermodynamic structure from GOES-VAS satellite retrievals are used to investigate a severe storm outbreak over the central United States on 21-22 July 1982. The satellite soundings are available at six times between 1100 and 2300 GMT 21 July. They are objectively analyzed to achieve meso alpha-scale resolution. The goal is to assess the usefulness of VAS data in diagnosing the changes in atmospheric structure that are conducive to storm formation. Just prior to thunderstorm development, increasing instability due to low-level warming, middle tropospheric cooling, and increasing water vapor content are detected. Several triggering mechanisms in the area explain the pattern of convection that follows. Though the VAS soundings appear to overestimate the atmospheric instability when compared to rawinsonode soundings, the general continuity of features in space and time is good. A second limitation of the VAS data is that extensive cloud cover limits the number of retrievals early in the study period. The research demonstrates that VAS soundings are a useful supplement to the standard 12 h rawinsonde data during this case. However, the retrieval algorithms should be investigated to determine whether any of the observed variations are attributable to deficiencies in these procedures.
Author (GRA)

N85-11513# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE LIFTING CONDENSATION LEVEL AND ITS RELATION TO CONVECTIVE CLOUD BASE M.S. Thesis
N. P. Wilde 1984 173 p
(AD-A145654; AFIT/CI/NR-84-40T) Avail: NTIS HC A08/MF A01 CSCL 04/2

This thesis explores the relationship between the lifting condensation level (LCL) and the height and time of convective cloud formation. Data collected from several different sources during the BLX83 field program is utilized. Sounding data is used to infer the mean structure of the LCL in the boundary layer. It is found that the lowest LCLs are usually within the lowest, or surface, portions of the convective boundary layer. High resolution cloud base data is obtained from lidar measurements of the boundary layer. These are compared to LCLs calculated using surface data from a PAM (Portable Automatic Mesonet) station. The initial formation of cumulus clouds is below, and earlier than, would be predicted based on the PAM data. The spatial variability of the surface LCL is inferred from near surface flights made by the NCAR Queen Air aircraft. It is seen that by combining the very lowest LCLs obtained by aircraft with the very highest thermals measured by lidar, a more accurate estimate of the time of initial cloud formation can be made. In addition, a decoupling of the surface-based LCL and cloud base is seen to occur later in the day. This is thought to be a function of greater, and more effective, entrainment into individual, surface-based thermals as the day wears on. Author (GRA)

N85-11514# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
EFFECTS OF A LIGHTNING STRIKE ON A CIVIL DEFENSE OPERATION CENTER
Torbjoern Karlsson Aug. 1984 22 p In SWEDISH; ENGLISH summary
(FOA-A-30035-A3; ISSN-0281-0212) Avail: NTIS HC A02/MF A01

Lightning strike effects on a civil defense center are analyzed and the path of the lightning current is described, from the 80 m high antenna mast through the laboratories to the power lines in the ground outside the center. Costly material, and power lines were destroyed. The estimated discharge current exceeded 100 KA. Possible reasons for the serious damage are given. Suggestions for preventing similar incidents include correct grounding (the mast was not grounded), avoiding power lines returning back to the transformer, storing costly materials in metal containers. Author (ESA)

N85-11393# South Africa Univ., Pretoria. Dept. of Statistics.
APPLICATION OF CORRESPONDENCE ANALYSIS TO METEOROLOGICAL DATA
Michael Greenacre and David Hudak (Water Research Commission) *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 60-74 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11394# Witwatersrand Univ., Johannesburg (South Africa). Climatology Research Group.
THE IDENTIFICATION OF RAIN-BEARING SYNOPTIC SYSTEMS THROUGH PRINCIPAL COMPONENT ANALYSIS
M. S. J. Harrison *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 75-92 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11395# Cansas International Corp. (Proprietary) Ltd. (South Africa).
A PRINCIPAL COMPONENT ANALYSIS OF EASTERN TRANSVAAL SEASONAL RAINFALL, 1950 TO 1981
G. K. Mather *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 93-114 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11396# Orange Free State Univ., Bloemfontein (South Africa). Dept. of Agrometeorology.
THE APPLICATION OF PRINCIPAL COMPONENT ANALYSIS IN A STUDY OF RAINFALL
B. Kelbe *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 115-133 (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-11515 Florida State Univ., Tallahassee.
A STUDY OF HIGHLY ENERGETIC NEAR-BOTTOM OCEAN FLOW AT THE BASE OF THE SCOTIAN RISE Ph.D. Thesis
Edward A. Kelley, Jr. 1984 120 p
Avail: Univ. Microfilms Order No. DA8416711

A comparison is made of long (8-12 mos) records of three near bottom current meters with satellite derived frontal positions of Gulf Stream meanders and rings. The energetic fluctuations coincide with, and most probably, result from the movement of Gulf Stream meanders and rings. The strong equatorward contour following flow near the 4,900 m isobath is decoupled from, and not part of, the Deep Western Boundary Current. A search of achived hydrographic data of the western North Atlantic shows the Cold Filament to be an ubiquitous feature near the base of the Continental Rise from the Grand Banks Ridge. A rough estimate of the dissipation of eddy kinetic energy as a result of the interaction of the Gulf Stream meanders and rings with the bottom indicates that this mechanism may account for roughly 50% of the energy input by the wind into the subtropical gyre of the western North Atlantic. Dissert. Abstr.

N85-11516# Alaska Univ., Fairbanks. Geophysical Inst.
HANDBOOK FOR SEA ICE ANALYSIS AND FORECASTING Final Report
W. J. Stringer, D. G. Barnett, and R. H. Godin Jun. 1984 275 p
(Contract N00228-81-C-H553)
(AD-A145286; NERPF-CR-84-03) Avail: NTIS HC A12/MF A01 CSCL 08/12

Background information and techniques used to analyze and forecast sea ice conditions are presented. Emphasis has been placed on operationally-oriented analysis and forecast rules and aids and the use of climatological charts containing parameters related directly to operational decision-making based on sea ice conditions. Subject material includes sea ice morphology, characteristics and dynamics, global and regional sea ice distribution and behavior, sea ice modeling, remote sensing principles and techniques, remote sensing systems used for sea ice analysis, auxilliary sea ice observations, meteorological and climatological relationships with sea ice, operational sea ice analysis, and sea ice forecasting techniques. Author (GRA)

N85-11517# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MIZEX. A PROGRAM FOR MESOSCALE AIR-ICE-OCEAN INTERACTION EXPERIMENTS IN ARCTIC MARGINAL ICE ZONES. III: MODELING THE MARGINAL ICE ZONE
W. D. Hibler, III Apr. 1984 104 p
(AD-A145351; CRREL-SR-84-7) Avail: NTIS HC A06/MF A01 CSCL 08/12

The main goal of the marginal ice zone experiment (MIZEX) is to understand the processes that dictate the advance and retreat of the ice margin. Mechanistic model sensitivity studies can greatly aid in this goal by identifying the relative importance of different processes in the total system. In addition, more complete simulation models can be used both to test the adequacy of current understanding of the marginal ice zone and to serve as an integrating device for complex data sets. This volume contains the main results from a MIZEX modeling workshop held 18-20 October in Hanover, New Hampshire. Modelers interested in both Arctic and Antarctic sea ice were present. The purpose of the workshop was to determine the status of marginal ice zone modeling and to discuss different views on modeling processes in the MIZ. Results from full simulation models, mechanistic models, and empirical statistical models were presented and discussed. In addition, recommendations relevant to experimental measurements were made. The recommendations were divided into ocean, ice, and atmospheric categories; these were also the three main subject areas covered by the presentations. Overall, the workshop helped to identify areas where further simulations are needed to test our understanding and where knowledge of certain processes is lacking. GRA

N85-11518# Washington Univ., Seattle.
ONE-YEAR RECORDS OF CURRENT AND BOTTOM PRESSURE IN THE STRAIT BETWEEN NORDAUSTLANDET AND KVITOEYA AND SVALBARD, 1980 - 1981 Interim Technical Report, 1 Oct. 1976 - 31 Mar. 1984
K. Aagaard, A. Foldvik, T. Gammelsroed, and T. Vinje 6 Aug. 1984 10 p
(Contract N00014-75-C-0893; Grant NSF DPP-81-00153)
(AD-A145594; TR-25) Avail: NTIS HC A02/MF A01 CSCL 08/3

We have obtained one year of measurements from a subsurface instrumented mooring carrying two current meters and one bottom pressure recorder in the strait between Nordaustlandet and Kvitoeya in the northeastern Svalbard archipelago. The observations show a mixed tide with typical amplitudes 0.4dB and 10 cm/sec. The semidiurnal tide is characterized by a progressive wave propagating toward the south, together with a cross-channel baroclinic mode. The annual average (non-tidal) current is less than 2 cm/sec toward the north-east, suggesting that the transport into the Arctic Ocean is approximately 200,000 cu m/s. GRA

N85-11519# Sandia Labs., Albuquerque, N. Mex.
HIGH-DATA-RATE WIDE-ANGLE UNDERWATER ACOUSTIC TELEMETRY SYSTEM
D. E. Ryerson and G. C. Hauser Jul. 1984 57 p refs
(Contract DE-AC04-76DP-00789)
(DE84-015696; SAND-84-0994) Avail: NTIS HC A04/MF A01

A high data rate wide angle underwater acoustic telemetry system is developed. The system is used to transmit data from subsurface ocean instrumentation to unattended ocean data buoys. The data are transmitted from the buoys to shore via the GOES satellites. This report describes the system, the design decisions behind it, and the results of a trial installation in the Gulf of Mexico. DOE

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-11520*# Arizona Univ., Tucson. Dept. of Biochemistry.
SKELETAL MUSCLE METABOLISM IN HYPOKINETIC RATS Semiannual Progress Report, 1 Apr. - 30 Sep. 1984
Marc E. Tischler 1984 5 p refs
(Grant NAGw-227)
(NASA-CR-174059; NAS 1.26:174059) Avail: NTIS HC A02/MF A01 CSCL 06C

Muscle growth, protein metabolism, and amino acid metabolism were studied in various groups of rats. Certain groups were

adrenalectomized; some rats were suspended while others (the controls) were weight bearing. Results show that: (1) metabolic changes in the extensor digitorum longus muscle of suspended rats are due primarily to increased circulating glucocorticoids; (2) metabolic changes in the soleus muscle due to higher steroid levels are probably potentiated by greater numbers of steroid receptors; and (3) not all metabolic responses of the soleus muscle to unloading are due to the elevated levels of glucocorticoids or the increased sensitivity of this muscle to these hormones. R.S.F.

N85-11521*# Research Triangle Inst., Research Triangle Park, N.C.
APPLICATIONS OF AEROSPACE TECHNOLOGY IN BIOLOGY AND MEDICINE Final Report
B. Bass, H. C. Beall, J. N. Brown, Jr., W. H. Clingman, R. E. Eakes, P. N. Kizakevich, M. McCartney, and D. J. Rouse Apr. 1982 132 p
(Contract NAS1-16177)
(NASA-CR-165872; NAS 1.26:165872) Avail: NTIS HC A07/MF A01 CSCL 06B

Utilization of National Aeronautics and Space Administration (NASA) technology in medicine is discussed. The objective is best obtained by stimulation of the introduction of new or improved commercially available medical products incorporating aerospace technology. A bipolar donor/recipient model of medical technology transfer is presented to provide a basis for the team's methodology. That methodology is designed to: (1) identify medical problems and NASA technology that, in combination, constitute opportunities for successful medical products; (2) obtain the early participation of industry in the transfer process; and (3) obtain acceptance by the medical community of new medical products based on NASA technology. Two commercial transfers were completed: the Stowaway, a lightweight wheelchair that provides mobility for the disabled and elderly in the cabin of commercial aircraft, and Micromed, a portable medication infusion pump for the reliable, continuous infusion of medications such as heparin or insulin. The marketing and manufacturing factors critical to the commercialization of the lightweight walker incorporating composite materials were studied. Progress was made in the development and commercialization of each of the 18 currently active projects. E.A.K.

N85-11522*# National Aeronautics and Space Administration, Washington, D. C.
FUNGI OF MT. BABIA GORA. 1: MYCOFLORA OF FORESTS
Anna Bujakiewicz May 1984 127 p Transl. into ENGLISH from Acta Mycol. (Poland), v. 15, no. 2, 1979 p 213-294 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77484; NAS 1.15:77484) Avail: NTIS HC A07/MF A01 CSCL 06C

A list of 617 taxons of fungi (macromycetes) recorded in the forests of the Mt. Babia Gora in the Western Carpathians is presented. M.A.C.

N85-11523*# Houston Univ., Tex.
[PHYLOGENIC DISTRIBUTION OF THE LARGE 55 rRNA FROM HALOCOCCUS MORRHUAE] Progress Report
[1984] 30 p refs
(Grant NsG-7440)
(NASA-CR-174019; NAS 1.26:174019) Avail: NTIS HC A03/MF A01 CSCL 06C

Sequence characterizations of bacterial ribonucleic acids are discussed. The phylogeny of various bacterial strains based upon RNA data is presented. R.S.F.

N85-11524# Naval Aerospace Medical Research Lab., Pensacola, Fla.
SPECIFIC ABSORPTION RATE IN A SITTING RHESUS MODEL AT 225, 1290, AND 5950 MHz FOR E, H, AND K POLARIZATIONS Interim Report
T. A. Griner and R. G. Olsen 23 Apr. 1984 17 p
(AD-A145435; NAMRL-1308) Avail: NTIS HC A02/MF A01 CSCL 06/18

Previous radio-frequency dosimetry studies of the E-polarized sitting rhesus model have shown higher specific absorption rates (SAR) than predicted by theoretical estimates based on a prolate spheroidal model. It was postulated that partial-body resonances tended to enhance the wholebody absorption. The purpose of this study was to further investigate the effects of enhanced whole-body SARs for three primary orthogonal orientations at three widely spaced irradiation frequencies. Author (GRA)

N85-11074# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON DERIVATION OF BIOLOGICAL MATERIALS, COSMONAUT ADAPTATION Abstract Only
A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 28-29 Transl. into ENGLISH from Izv. (Moscow), 22 Jul. 1984 p 3 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-11525* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY, A CONTINUING BIBLIOGRAPHY WITH INDEXES
Nov. 1984 103 p
(NASA-SP-7011(264); NAS 1.21:7011(264)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 365 reports, articles and other documents introduced into the NASA scientific and technical information system in October 1984. E.A.K.

N85-11526# Canadian Centre for Occupational Health and Safety, Hamilton (Ontario).
THE CASE FOR CONCERN ABOUT VERY LOW FREQUENCY FIELDS FROM VISUAL DISPLAY TERMINALS: THE NEED FOR FURTHER RESEARCH AND SHIELDING OF VDTS
Karel Marha, Barry Spinner, and Jim Purdham 22 Apr. 1983 25 p refs
(CCOHS-P83-2E; ISBN-0-660-11440-2) Avail: NTIS HC A02/MF A01

Very low frequency (VLF) electromagnetic fields emitted from visual display terminals (VDT) are considered. Evidence of pulsed VLF electromagnetic fields from VDTs is presented along with evidence of biological and detrimental effects of pulsed electromagnetic radiation. The effectiveness of radiation shielding is also addressed. Existing radiation standards and exposure limit values are given. R.S.F.

N85-11527# Canadian Centre for Occupational Health and Safety, Hamilton (Ontario).
PHOTOCOPIERS: DO THEY POSE A HEALTH HAZARD?
David M. Halton Apr. 1983 28 p refs
(P83-1E; ISBN-0-660-11439-9) Avail: NTIS HC A03/MF A01

The current technologies used in photocopying machines are briefly described. Concerns that were raised about health and safety at each step of the copying process are discussed. Particular emphasis was placed on the chemical components of the copying technologies. Where appropriate, exposure controls are suggested. Recommendations are made with regard to the safety features of machines and the need to enhance the free flow of information from the manufacturers to the public. Author

N85-11528# Naval Health Research Center, San Diego, Calif.
THE EFFECT OF SLEEP LOSS ON THE HUMAN VISUAL EVENT-RELATED POTENTIAL Interim Report
D. J. Hord and M. Tracy 1984 13 p
(DARPA Order 1596; F63528)
(AD-A145364; NAVHLTHRSCHC-84-24) Avail: NTIS HC A02/MF A01 CSCL 06/16

In eight volunteer subjects, the latency of both crest and trough components of visual sensory Event-Related Potentials (ERPs) was found to be increased following 48 hours of total sleep deprivation, relative to baseline levels. The amplitude of the component was not affected, nor was the recovery cycle. These results, together with previously reported data from other studies, led to the hypothesis that the ERP may be a measure of brain function that differentiates fatigue and drowsiness. Whereas drowsiness is accompanied by changes in amplitude but not latency of the ERP, after sleep deprivation the opposite effect is seen; the latency of visual ERPs increases but amplitude is not affected. The ERP may prove to be a rapidly obtained, objective measure of fatigue that does not depend on subjective responses or on complex behavioral tests. Author (GRA)

N85-11529# Harvard Medical School, Boston, Mass. Dept. of Physiology and Biophysics.

JET LAG PREVENTION: PHYSIOLOGICAL MECHANISMS AND PHARMACOLOGICAL THERAPY Final Scientific Report, 1 Apr. 1978 - 31 Mar. 1983

M. C. Moore-Ede 31 Mar. 1984 17 p

(Grant AF-AFOSR-3560-78)

(AD-A145444; AFOSR-84-0752TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

This research program was concerned with the physiological mechanisms that underlie the phenomenon of jet-lag and was aimed at developing therapeutic techniques to minimize the performance and physiological deficits that occur in rapid trans-meridian air travel. During the course of this project, the circadian pacemaker responsible for the timing of the daily rest-activity was identified in the brain of the diurnal primate, the squirrel monkey (Saimiri sciureus). The suprachiasmatic nuclei were also identified in the human brain. A number of other significant advances included: developing a model of the circadian sleep-wake cycle, characterizing how phase shifts of the light-dark cycle reset the timing of the sleep-wake cycle, and identifying pharmacological agents which can phase-reset the circadian system. GRA

N85-11530# Naval Aerospace Medical Research Lab., Pensacola, Fla.

DARK FOCUS: INTERSUBJECT VARIATION, INTRASUBJECT STABILITY, AND RELATIONSHIP TO NEAR RETINOSCOPY Interim Report

W. A. Monaco and C. G. Knowlton Apr. 1984 18 p

(AD-A145489; AD-E000594; NAMRL-1307) Avail: NTIS HC A02/MF A01 CSCL 06/16

Previous studies have shown that dark focus varies between individuals while remaining relatively fixed over time. These relationships were quantified in a population of future naval aircrewmen to determine whether or not individual variability exists in a group who have met stringent visual screening requirements. In addition, it has been reported that near retinoscopy, a clinical measure, is a means to determine dark focus that may be used by clinicians. The relationship between near retinoscopic values and dark focus measures needed further study. This study found that dark focus exhibited intersubject variation and intra-subject stability in a population of future naval aircrewmen. Because dark focus is correlated with empty field myopia, it could have potential in screening aviators for susceptibility to empty field myopia and their ability to detect air-to-air targets. Near retinoscopy was found to be correlated with dark focus, but further study is needed to define the relationship. GRA

N85-11531# Texas Univ., Arlington. Arlington.

EYELID MOTION SEQUENCES PREDICTIVE OF DECISION ERRORS Final Report, Apr. 1983 - Aug. 1984

M. L. Lobb 30 Aug. 1984 13 p

(Grant AF-AFOSR-0129-83)

(AD-A145702; AFOSR-84-0773TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

Nine normal human subjects were measured by electrooculographic and video tape of the eyes during performance on a human/animal analog of the serial probe recognition task. The task was modified to distinguish attention (the missed signal) errors from decision (failure to make same versus different discrimination) errors. Two types of eyelid closing and reopening sequences were observed to be progressive with time-on-task, with the earlier, Type 1 sequence being indicative of correct responses. The velocity of the eyelid in motion over the pupil also significantly discriminated decision correct from decision error trials. The results were interpreted to support the hypothesis that information processing function progressively deteriorates over time-on-task and is indicated by variations in oculomotor patterns. GRA

N85-11532# Harvard Medical School, Boston, Mass. Dept. of Physiology and Biophysics.

MATHEMATICAL MODELS OF THE CIRCADIAN SLEEP-WAKE CYCLE Final Scientific Report, 1 May 1981 - 30 Nov. 1982

M. C. Moore-Ede, ed. and C. A. Czeisler, ed. New York, New York Raven Press 1 May 1984 226 p Proceedings of the Satellite Symp. on the Math. Modeling of Circadian Systems, Cape Cod, Mass., 21 Jun. 1981

(Grant AF-AFOSR-0133-81)

(AD-A145712; AFOSR-84-0781TR) Avail: NTIS HC A11/MF A01 CSCL 06/16

This contract funded a Satellite Symposium on the Mathematical Modeling of Circadian Systems which was held on June 21, 1981 in conjunction with the Annual Meeting of the Association for the Psychophysiological Study of Sleep (APSS) from June 17-21, 1981, at Dunfey's Hyannis Hotel on Cape Cod, Massachusetts. The Satellite Symposium brought together the leading investigators concerned with modeling the circadian system to ensure that the various proposed models were critically reviewed and their strengths and weaknesses in predicting periodic biological phenomena were fully understood. The papers of each participant and an edited transcription of the discussion were published as a book entitled 'Mathematical Models of the Circadian Sleep-Wake Cycle' by Raven Press in 1984. The published volume serves as an important source of all those who are concerned about the temporal organization of human and animal behavior and physiology. Author (GRA)

N85-11533# Research Inst. of National Defence, Stockholm (Sweden).

MAN'S PHYSICAL TOLERANCE TO HEAT. HEAT STORAGE, BURN INJURY

Ulf Danielsson May 1984 54 p refs In SWEDISH; ENGLISH summary

(FOA-C-54055-H1; ISSN-0347-7665) Avail: NTIS HC A04/MF A01

Heat exposure time which results in 50% risk of heat exhaustion was calculated for metabolic heat production = 150 W/sq m and 300 W/sq m, and air temperature and heat radiation between 60 C, 1200 W/sq m and 300 C, 7300 W/sq m. These parameters correspond to moderate and heavy physical workloads in an ordinary indoor fire. The effects of time to heat exhaustion were calculated for clothes with various insulations for air temperature = 140 C. The shortest time to heat exhaustion, not resulting in heat injury, is 5 min if the body is uniformly exposed. The capacity of protective clothing to reduce heat load depends on the thickness of the material. Author (ESA)

N85-11534# Sheffield Univ. (England). Dept. of Control Engineering.

SMITH PREDICTOR AND SELF-TUNING CONTROL OF MUSCLE RELAXANT DRUG ADMINISTRATION

D. A. Linkens, M. Menad, and A. J. Asbury 1984 27 p refs (RR-257) Avail: NTIS HC A03/MF A01

Control, dead-time compensation, and on-line identification and control were applied to relaxation management in anesthesia, in clinical trials using a dog. Closed-loop control gives insight into the classic pharmacokinetic compartmental modelling problem and provides a test environment capable of quantifying interacting effects from other drugs. Provided care is taken to jacket the self-tuner, self-tuning control of muscle relaxation is shown to be

feasible, safe and efficient. As well as being a satisfactory control strategy in its own right, the Smith predictor structure, when used to provide jacketting, greatly improves system speed of response.
Author (ESA)

N85-11535# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabteilung Strukturberechnung und -versuch, Akustik.
LOCOMOTION RESEARCH FOR THE ANALYSIS OF THE HUMAN GAIT AND FOR THE DETERMINATION OF THE MAXIMUM LOADS OF THE PELVIS-LEG SKELETON. VOLUME 1: TWO-DIMENSIONAL ANALYSIS Final Report, Mar. 1980
Herbert Roehrle, Rudolf Scholten, Carlo Sigolotto, and Werner Sollbach Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 150 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-83-187-Vol-1; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,50

A climbing test track for the determination of human locomotion and foot-ground forces during horizontal walking and step climbing was developed. The measurement information is furnished by an opto-electronic movement monitoring system, a multicomponent measuring platform, and an interference pattern sandwich platform. An optimization method program system to calculate the time-dependent muscle and joint forces is described. Sixteen subjects and 64 test runs, taking into account the gait velocity, the body height and weight were analyzed. The characteristics of the neutral gait and the joint forces in the pelvis-leg skeleton are shown.
Author (ESA)

N85-11536# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabteilung Strukturberechnung und -versuch, Akustik.
LOCOMOTION RESEARCH FOR THE ANALYSIS OF THE HUMAN GAIT AND FOR THE DETERMINATION OF THE MAXIMUM LOADS OF THE PELVIS-LEG SKELETON. VOLUME 2: THREE-DIMENSIONAL ANALYSIS Final Report, Mar. 1981
Herbert Roehrle, Carlo Sigolotto, and Werner Sollbach Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 140 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-83-188-Vol-2; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 29,50

Three-dimensional human locomotion during horizontal walking and climbing stairs was measured with a specially calibrated opto-electronic camera system. A multicomponent measuring platform was used to acquire the force components between foot and ground and the force application point. Measurements were carried out on 21 male and 5 female subjects for different gait speeds. A program system, based on an optimization method, was used to calculate time dependent and three-dimensional muscle and joint forces in the pelvis-leg skeleton. The maximum joint forces depending on gait speed, body weight and height are shown. It is shown that the three-dimensional analysis reveals clearly lower joint loads than the simplified plane consideration.
Author (ESA)

N85-11071# Joint Publications Research Service, Arlington, Va.
TASS REPORTS MEDICAL, MATERIALS STUDIES ABOARD SALYUT-7 Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 24 Transl. into ENGLISH from Pravda (Moscow), 21 Jul. 1984 p 1 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-11537# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AIR-TO-AIR VISUAL ACQUISITION PERFORMANCE WITH TCAS 2
John W. Andrews 7 Nov. 1984 44 p refs
(Contracts F19628-85-C-0002; DOT-FA77WAI-817)
(FAA-PM-84-17; ATC-130) Avail: NTIS HC A02/MF A01

The ability of pilots to visually acquire aircraft approaching on collision courses is analyzed using a mathematical model of visual acquisition. The model is calibrated by reference to subject pilot flight test data resulting from testing of the Traffic Alert and Collision Avoidance System (TCAS). Techniques are presented that allow the determination of the probability of visual acquisition for a range of intruder aircraft sizes and closing rates. The effect of visual range (atmospheric visibility) upon visual acquisition performance is analyzed.
Author

N85-11538# Oregon Univ., Eugene. Dept. of Computer and Information Science.
VISUAL REPRESENTATIONS SUBSERVING TEXTURE PERCEPTION Annual Report, 30 Apr. 1983 - 1 May 1984
J. Beck and K. A. Stevens 23 May 1984 15 p
(Contract F49620-83-C-0093)
(AD-A145412; AFOSR-84-0753TR; AR-1) Avail: NTIS HC A02/MF A01 CSCL 05/10

The ongoing research investigates the representations of visual texture and the processes that detect discontinuities and structure in visual texture. Psychophysical experiments have investigated the salience of bar orientation and the effect of groupings in texture segmentation. We are examining the role of elongated receptive field mechanisms in computing both local measures of orientation and their possible role in texture segmentation. We have found such mechanisms, however, to be less appropriate for determining one-dimensional groupings of (collinear) discrete items of texture. Combined psychophysical and computational studies have provided evidence for place tokens in groupings, and current work is directed towards understanding how these tokens may be defined in fine-scale texture detail. To support this work, a vision laboratory has been established based on a Symbolics 3600 Lisp Machine.
Author (GRA)

N85-11539# Logicon, Inc., San Diego, Calif.
AIRBORNE PERFORMANCE MEASUREMENT SYSTEM DESIGN: C-5 AIRCRAFT Final Report, Feb. 1983 - Jan. 1984
N. J. Barmatz, T. R. Daniell, R. Lombard, C. F. Schmitt, and W. L. Waag Aug. 1984 127 p
(Contract F33615-83-C-0025)
(AD-A145436; AFHRL-TR-84-13) Avail: NTIS HC A07/MF A01 CSCL 05/9

This study identified and defined the required functional capabilities of an airborne performance measurements system for the C-5 aircraft. The requirements of the airborne PMS were defined to satisfy both research and training needs. A mission equivalent to the nominal mission utilized in the C-5 flight simulator PMS was defined. The C-5 aircraft signals that can be extracted to support the performance measurement of this mission were identified. From this a series of design approaches for an airborne PMS was developed. A system design specification was produced for an airborne PMS system selected from these design approaches.
GRA

N85-11540# Harvard Univ., Cambridge, Mass. Dept. of Psychology.
TOWARD A COMPUTATIONAL NEUROPSYCHOLOGY OF HIGH-LEVEL VISION Interim Report
S. M. Kosslyn 20 Aug. 1984 46 p
(Contracts N00014-82-C-0166; N00014-83-K-0095)
(AD-A145711; TR-3) Avail: NTIS HC A03/MF A01 CSCL 06/16

Visual information processing in humans was studied from three distinct perspectives. This paper develops a way of melding the approaches of Artificial Intelligence, Cognitive Psychology, and Neuropsychology, and explores the advantages of such a hybrid approach. Each of the individual approaches has its strengths and weaknesses, but these are different for the different approaches. It is argued in this paper that by combining the three, we are in a position to take advantage of each one's strengths and may be able to circumvent each one's weaknesses. Additional keyword topics include mental imagery and computer models.
GRA

N85-11541# Nova Technical, Inc., Tarzana, Calif.
AN INVESTIGATION OF THE USE OF STEADY-STATE EVOKED POTENTIALS FOR HUMAN PERFORMANCE AND WORKLOAD ASSESSMENT AND CONTROL Annual Report, 15 Jun. 1983 - 14 Jun. 1984
S. L. Moise, Jr. 14 Jun. 1984 20 p
(Contract F49620-83-C-0102)
(AD-A145727; AFOSR-84-0770TR) Avail: NTIS HC A02/MF A01 CSCL 05/10

This report describes the status of this AFOSR sponsored research program during the reporting period. This research program is designed to examine high frequency (40-60 Hz) Steady-State Evoked Potentials as a tool for providing information about human sensory and performance capability. In particular, a measure of relative transmission time through the visual system is to be evaluated. This report details the configuration of the test and data collection facility and reports the results of control and pilot studies. Some of this data suggests that there may be a frequency masking effect in the visual system when multiple visual frequencies are simultaneously presented. If this is verified, it may represent a previously unobserved basic property of the visual system response to flashing stimuli. GRA

N85-11542# Rice Univ., Houston, Tex. Dept. of Psychology.
THE EFFECTS OF FEEDBACK AND PREDICTABILITY OF HUMAN JUDGMENT
B. S. Goldsberry Aug. 1984 167 p
(Contract N00014-82-C-0001)
(AD-A145744; AD-E001749; TR-84-3) Avail: NTIS HC A08/MF A01 CSCL 05/10

Previous research has found that when subjects are given cognitive feedback, they reach higher levels of achievement than when they are given outcome feedback. It was hypothesized that this finding was due in part to the predictability of the task environment since outcome feedback is at a distinct disadvantage as a sole means of conveying such information. A study was conducted to compare response and outcome feedback under three predictability conditions. The design included a control group receiving no feedback at all, two response groups differing in precision of feedback information, and two outcome feedback groups differing on a quantity dimension. The study also attempted to clarify the definition of feedback and to equate the availability of task information in the various feedback conditions that were compared. Contrary to expectations, the utility of outcome feedback was inferior to that of response feedback under all three predictability conditions tested. In fact, an interaction revealed that the effect of increased predictability raised rather than lowered the disparity between outcome and response feedback performance. The results also revealed that a control group receiving no feedback at all performed as well as or better than those with feedback when the availability of task information was equated. Moreover, eliminating the memory requirement inherent in the use of outcome feedback only worsened performance. Similarly, adding precision to the response feedback condition beyond the level of mere directional error information did not improve performance.
GRA

N85-11543# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
USING GROSS OUTLINE FEATURES IN LONG RANGE TARGET IDENTIFICATION
Bjoern Modeer Jun. 1984 21 p refs In SWEDISH; ENGLISH summary
(FOA-C-53018-H2; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Distance effects on the use of gross features to identify target silhouettes were studied. Silhouette pictures of three vehicles and three rectangles of corresponding size and form were shown on black and white slides. Four simulated ranges between 3 and 6 km were used; 12 subjects made 480 observations each. Length-to-width ratio of the targets is important for identification up to 6000 m. It is possible to distinguish outline features at ranges which correspond to the resolution limit of the eye. The composition of the target set with regard to similarity between the targets has a great influence on the performance. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-11544*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
DECISION TREE RATING SCALES FOR WORKLOAD ESTIMATION: THEME AND VARIATIONS Final Report, 1 Feb. 1983 - 14 Mar. 1984
Walter W. Wierwille, Julie H. Skipper, and Christine A. Rieger (Hughes Aircraft Co., Fullerton, Calif.) 14 Mar. 1984 14 p refs (Grant NAG2-17)
(NASA-CR-174062; NAS 1.26:174062) Avail: NTIS HC A02/MF A01 CSCL 05H

The Modified Cooper-Harper (MCH) scale which is a sensitive indicator of workload in several different types of aircrew tasks was examined. The study determined if variations of the scale might provide greater sensitivity and the reasons for the sensitivity of the scale. The MCH scale and five newly devised scales were examined in two different aircraft simulator experiments in which pilot loading was treated as an independent variable. It is indicated that while one of the new scales may be more sensitive in a given experiment, task dependency is a problem. The MCH scale exhibits consistent senstivity and remains the scale recommended for general use. The MCH scale results are consistent with earlier experiments. The rating scale experiments are reported and the questionnaire results which were directed to obtain a better understanding of the reasons for the relative sensitivity of the MCH scale and its variations are described. E.A.K.

N85-11545# Naval Aerospace Medical Research Lab., Pensacola, Fla.
DEVELOPMENT AND EVALUATION OF A PERFORMANCE-BASED TEST OF SACCADIC AND VESTIBULO-OCULAR CONTROL Summary Report
L. C. Percival and F. E. Guedry, Jr. 16 Jan. 1984 61 p
(MR00001)
(AD-A145367; NAMRL-1306) Avail: NTIS HC A04/MF A01 CSCL 06/16

Acquisition of visual information from spatial points disparate enough to necessitate head and eye movement involves the vestibular and other oculo-motor control systems in shifting and stabilizing gaze relative to those points. In the present study a simple procedure to test oculomotor abilities was developed and evaluated; it uses performance to establish initial gaze position and to insure the required gaze shift and stabilization is rapidly produced. Performance in three experiments was consistently and powerfully influenced by stimulus exposure duration, and to a lesser extent by the size of the required gaze shift. The performance of normal subjects in eye movement and head-and-eye movement conditions is quite predictable from static performance of normals. There were two main conclusions: 1) The powerful effect of exposure time on performance suggests that the procedure will

be sensitive to certain types of central nervous system and vestibular pathology. 2) Variation in performance characteristics implies that the procedure may be sensitive to individual differences in oculomotor abilities. Author (GRA)

N85-11546# Albany International Corp., Dedham, Mass.
RESISTANCE OF NAVY SHIPBOARD OUTERWEAR GARMENTS AND FIRE-RESISTANT FABRICS TO EXTREME HEAT Final Technical Report, 18 Jan. 1982 - 4 Dec. 1983
M. M. Schoppee, J. M. Welsford, and N. J. Abbott Dec. 1983 138 p
(Contract N00140-82-C-BD00)
(AD-A145414; NCTRF-153) Avail: NTIS HC A07/MF A01 CSCL 06/17

The heat protective capabilities of a variety of fabrics used in Navy Shipboard outerwear garments have been characterized in several ways. Fabric tensile strength retention during short-term exposure to bilateral radiant heat at fluxes to 0.8 cal/sq cm sec, time-to-ignition at bilateral radiant fluxes to 1.1 cal/sq cm/sec, and the level of heat transferred to an underlying surface as the result of unilateral radiation to 1.25 cal/sq cm/sec and flame exposure at 2.2 cal/sq cm/sec have all been measured. Thirty-six single-layer fabrics and fabric assemblies have been used in the investigation ranging in weight from 3 to 25 oz/sq yd. Fabric materials tested include cotton, wool, modacrylic, Nomex, Kevlar, PAN, corespan semi-carbon/Kevlar, coated fabrics and various blends. GRA

N85-11547# Army Agency for Aviation Safety, Fort Rucker, Ala.
ANTHROPOMETRIC COCKPIT COMPATIBILITY ASSESSMENT OF US ARMY AIRCRAFT FOR LARGE AND SMALL PERSONNEL WEARING A COLD WEATHER, ARMORED VEST, CHEMICAL DEFENSE PROTECTIVE CLOTHING CONFIGURATION Final Report
D. O. Cote and A. W. Schopper Jul. 1984 55 p
(AD-A145472; AD-E750919; USAARL-84-11) Avail: NTIS HC A04/MF A01 CSCL 05/5

This report on individuals wearing a warm weather uniform presents the results of an anthropometric cockpit compatibility evaluation conducted with individuals wearing a worst-case tactical clothing configuration; i.e., a combination of cold weather, armored vest, and chemical defense protective clothing. Subjects corresponding in stature to the uppermost and lowermost 5th percentiles of the Army male population were placed in the cockpits of all current US Army helicopters (except AAH-64) and fixed-wing aircraft, and requested to demonstrate critical operational reaches with the shoulder harness unlocked. A relatively wide range of upper- and lower-body reach requirements were encountered. With the exception of a very large requirement associated with the TH-55 helicopter, upper-body reach requirements, as measured by total arm reach (span), ranged from 147-173 cm. For crotch height, the measure of leg-reach capability found most efficient, the range was 69-76 cm. Four aircraft could not accommodate the individual with the tallest sitting height (102) cm. GRA

N85-11548# Air Force Human Resources Lab., Brooks AFB, Tex.
AIR FORCE HUMAN RESOURCES LABORATORY REPORT: FISCAL YEAR, 1983 Final Technical Paper 1 Oct. 1982 - 30 Sep. 1983
R. M. Buescher Aug. 1984 141 p
(AD-A145647; AFHRL-TP-84-2) Avail: NTIS HC A07/MF A01 CSCL 14/2

This Annual Report presents the organization and activities of the Air Force Human Resources Laboratory (AFHRL) for FY83. The Laboratory's activities are reported as Technical Achievements and as Ongoing Research and Development (R&D) as determined by the degree of completeness of the project. Additionally, the activities are presented in terms of the Laboratory's major thrusts and subthrusts: Diagrams highlighting the R&D thrusts (Maintenance and Combat Support, Training Design and Delivery, Manpower and Force Management, and Air Crew Training) and their subthrusts are presented to provide the context for the descriptions of specific projects. GRA

N85-11549# Navy Personnel Research and Development Center, San Diego, Calif.
HUMAN ENGINEERING DATA BASE FOR DESIGN AND SELECTION OF CATHODE RAY TUBE AND OTHER DISPLAY SYSTEMS Technical Report, Sep. 1982 - Jun. 1984
D. Meister Jul. 1984 362 p
(AD-A145704; NPRDC-TR-84-1) Avail: NTIS HC A16/MF A01 CSCL 05/5

This guide is intended to serve as a source of basic data for display engineers on human capabilities and performance as related to the visual display characteristics of CRT and other displays. Its primary purpose is to acquaint visual display engineers with what is currently known about the relation between observer characteristics and various types of display applications. The literature dealing with operator performance in using electronic displays has been compiled to serve as a human performance data base and guide for the design of new Navy systems. GRA

N85-11550# Research Inst. of National Defence, Umea (Sweden). ABC Research Dept.
RESPIRATORY PROTECTION FOR CHILDREN 3 - 6 YEARS OF AGE
Per-Gunnar Joensson, Lennart Sandberg, and Roger Sundqvist May 1984 26 p refs In SWEDISH; ENGLISH summary
(FOA-C-40197-C2; ISSN-0347-2124) Avail: NTIS HC A03/MF A01

Two respiratory devices for young children, a mask and a tight protection jacket, are described. The devices were tested for 25 min on 86 children in the first case and 122 in the second. Protection properties, comfort aspects, and the children's tendency to accept the protective device were compared. The mask is better tolerared than the jacket. Author (ESA)

N85-11551# Linkoeping Univ. (Sweden). Dept. of Biomedical Engineering.
THE WATER VAPOR RESISTANCES OF SOME CLOTHING ASSEMBLIES USED BY FLYING PERSONNEL OF THE SWEDISH ARMED FORCES: A SERIES OF MODEL STUDIES
A. Lena Nilsson, Gert E. Nilsson, and Lars E. Eriksson May 1984 35 p refs
(FOA-C-59011-H1; ISSN-0347-7665) Avail: NTIS HC A03/MF A01

Water vapor resistance of clothing assemblies used by the flying personnel of the Swedish armed forces was determined using a dish filled with an evaporative solution above which the clothing was fixed. Measurements were performed in a hot, dry environment without forced convection and temperature gradients. Flying suits made from Kermel are more resistive to sweat transfer compared to those made from Ventile fabric. Eiser sweat absorption shirts and Irotermo sweat absorption shirts have the same sweat transfer properties. Eiser underwear and Irotermo underwear have better sweat transfer properties than cotton underwear. Water vapor resistance depends on the sodium chloride concentration in transferred sweat. Water vapor resitance for complete clothing diminishes when the clothing becomes partly wet. Water vapor transfer can be improved by applying an air pressure gradient. Author (ESA)

N85-11552# Research Inst. of National Defence, Stockholm (Sweden).
TESTING OF THREE DIFFERENT FLIGHT SUITS IN FIRE ENVIRONMENT
Christer Spaangberg May 1984 67 p refs In SWEDISH; ENGLISH summary Sponsored by Swedish Material Administration of Armed Forces
(FOA-C-59012-H1; ISSN-0347-7665) Avail: NTIS HC A04/MF A07

Flight suits manufactured from cotton, cotton/polyester, and polyamide-imide were fire tested on a glass fiber reinforced plastic arm. The surface temperature of the arm was adjusted to 27/33 C by water circulation inside; the surface temperatures of the arm were measured by thermocouples. Results show that the protection assured by the suits depends on the type of fabric and the

thermal insulation under the suits. Two of the suits shrank during the first seconds exposure, so that the isolating air layer mostly disappeared. The resistance to heat is much better with the isolated-type suit, the fabric of which has two stable, not very porous, heavy layers. The thermal damage to the dermis and epidermis was evaluated for each test. Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-11553# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE APPLICATION OF MICROPROCESSORS IN THE COMMAND AND CONTROL OF SATELLITES BY THE MECB STATIONS [USO DE MICROPROCESSADORES NAS ESTACOES DE RASTREIO E CONTROLE DE SATELITES DA MECB]

Satoshi Koshima Sep. 1984 18 p refs In PORTUGUESE; ENGLISH summary

(INPE-3282-RPE/466) Avail: NTIS HC A02/MF A01

The application of the microprocessor in the equipments of a MECB TT&C Station for supervision is described, as well as an analysis of the standardization of the microprocessor, data buses and boards in regards of the maintenance of the Station. Author

N85-11554# Royal Signals and Radar Establishment, Malvern (England).

DISCUS MULTIPROCESSOR ENHANCEMENTS

H. S. Field-Richards and M. P. Griffiths May 1983 82 p refs

(RSRE-MEMO-3591; BR89343) Copyright. Avail: NTIS HC A05/MF A01

Cards which form the so-called DISCUS Mark 1.5 were produced to give the system increased protection from deliberately or accidentally introduced errors. Slight changes required in the operating system to incorporate the new facilities are documented. Author (ESA)

N85-11555# Washington Univ., Seattle. Dept. of Computer Science.

SUPERCOMPUTERS AND VLSI: THE EFFECT OF LARGE SCALE INTEGRATION ON COMPUTER ARCHITECTURE Interim Report

L. Snyder Aug. 1984 12 p

(Contract N00014-84-K-0143)

(AD-A145408; TR-84-08-05) Avail: NTIS HC A02/MF A01 CSCL 09/2

The use of VLSI technology to build supercomputers is analyzed in depth. The benefits of VLSI are reviewed, and the liabilities are explored thoroughly. The perimeter problem and the planarity problem are identified as being critical limits on architectural design. The CHiP architecture, a highly parallel computer designed with VLSI implementation in mind, is scrutinized in terms of how well it exploits the benefit fo VLSI and how well it avoids the liabilities. Not surprisingly, it does pretty well. Author (GRA)

N85-11556# Naval Postgraduate School, Monterey, Calif.

SYSTEMS ANALYSIS FOR MICROCOMPUTER ACQUISITIONS M.S. Thesis

H. P. Rhoades Mar. 1984 62 p

(AD-A145447; AD-E750943) Avail: NTIS HC A04/MF A01 CSCL 09/2

This thesis outlines the procedures for an analysis to be conducted to assist in the acquisition of a microcomputer. It provides a methodology to analyze present system operations, determine technical and economic feasibility of a microcomputer, and select hardware and software to meet organizational requirements. The intent of this thesis is to assist a Division Officer, Branch Chief, or small unit Commanding Officer who wants to increase productivity of specific outputs and feels a microcomputer may be the answer. GRA

N85-11557# Los Alamos Scientific Lab., N. Mex. Electronics Div.

DESIGN AND DESCRIPTIVE TOOLS FOR SYSTOLIC ARCHITECTURES

Paul Steven Lewis 1984 9 p refs Presented at the 28th Ann. SPIE Intern. Tech. Symp. and Instrument Exhibit, San Diego, Calif., 19-24 Aug. 1984

(Contract W-7405-eng-36)

(DE84-015521; LA-UR-84-2343; CONF-840872-13) Avail: NTIS HC A02/MF A01

Automated design and descriptive tools are essential for the practical application of highly parallel special-purpose hardware such as systolic arrays. The use of special-purpose hardware can greatly increase the capabilities of signal processing systems. However, the more limited applications base makes design costs a critical factor in determining technical and economic viability. Systolic systems can be described at several levels of abstraction, each of which has unique descriptive requirements. The descriptive issues involved at the system architectural level are addressed. Tools at this level must bridge the gap between logic- and circuit-oriented computer-aided design tools and algorithmic descriptions of systolic architectures. Traditionally, hardware description languages (HDLs) were used at this level to describe conventional computer architectures. Systolic architectures, however, have different requirements. These requirements are examined and a set of critical for evaluating HDLs is developed. Four popular HDLs are evaluated and their strengths and weaknesses noted. Ongoing efforts at Los Alamos to develop a systolic array HDL based on the CONLAN family of languages are summarized. DOE

N85-11558# Joint Publications Research Service, Arlington, Va.

EAST EUROPE REPORT, SCIENCE AND TECHNOLOGY. CZECHOSLOVAKIA: SYSTEM OF SMALL ELECTRONIC COMPUTERS

5 Nov. 1984 256 p refs Transl. into ENGLISH from Vyber Informaci z Organizacni a Vypocetni Techniky (Prague), 1982 p 1-207

(JPRS-ESA-84-040) Avail: NTIS HC A12/MF A01

The technological development of microcomputers and systems miniaturization are discussed. Topics discussed include: (1) hardware systems, disk memories, tape memories, printers, graphic systems, terminals and data transmission, interfacing; (2) software, operating sustems, telecommunication, programming languages; (3) operational and installation conditions; (4) training for management, programmers, system programmers, operators, and technicians; (5) planning and technical assistance, remote data processing. E.A.K.

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-11559*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTONOMOUS ATTITUDE DETERMINATION SYSTEM (AADS). VOLUME 1: SYSTEM DESCRIPTION
Kishor Saralkar (Computer Sciences Corp.), Yury Frenkel (Computer Sciences Corp.), Gerald Klitsch (Computer Sciences Corp.), Kuen-San Liu (Computer Sciences Corp.), Eugene Lefferts, Keiji Tasaki, Frank Snow, and James Garrahan (Computer Sciences Corp.) Apr. 1982 356 p refs
(NASA-TM-87385; NAS 1.15:87385; STL-83-003) Avail: NTIS HC A16/MF A01 CSCL 09B

Information necessary to understand the Autonomous Attitude Determination System (AADS) is presented. Topics include AADS requirements, program structure, algorithms, and system generation and execution. M.A.C.

N85-11560# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CRITERIA FOR THE OPTIMIZATION OF PROCESSING FLOW IN A MODEL OF AN INCREMENTAL COMPUTER WITH MULTI-PROCESSING RESOURCES M.S. Thesis - 14 Oct. 1983 [CRITERIOS PARA OTIMIZACAO DO FLUXO DE PROCESSAMENTO EM UM MODELO DE COMPUTADOR INCREMENTAL COM RECURSOS DE MULTIPROCESSAMENTO]
Mario Missawa Mar. 1984 123 p refs IN PORTUGUESE; ENGLISH summary
(INPE-3046-TDL/158) Avail: NTIS HC A06/MF A01

The optimization of the flow of processing in a model of an incremental computer is discussed. This is done via proper allocation of tasks to the multiple parallel processor resources, available in the computer. The main purpose of the proposed scheme is to establish a set of rules which may help to define a methodology appropriate for obtaining an optimized processing of some classes of application problems. These rules are very important for efficient utilization of the Incremental Computer ASTRO-L-V. Author

N85-11561# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROPOSAL FOR A SEMIAUTOMATIC PROGRAM TESTING SYSTEM M.S. Thesis [PROPOSTA DE UM SISTEMA SEMI-AUTOMATICO PARA TESTE DE PROGRAMAS]
Nuno Cesar daRocha Ferreira Sep. 1984 124 p refs In PORTUGUESE; ENGLISH summary
(INPE-3262-TDL/178) Avail: NTIS HC A06/MF A01

This work reflects the effort towards the development of software tools to be used in the selection of testing data for FORTRAN programs. An interactive system is described for analyzing programs which provides the user, at the end of an execution of a given program, with a set of predicates obtained through partial Symbolic Execution involving the symbolic treatment of input variables of this given program. This set of predicates can then be used in the identification of a new set of testing data to be submitted to the program being tested. Complete examples are given to illustrate in detail the use of the system. B.W.

N85-11562# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PASCAL-MP ALGEBRAIC AND NUMERICAL MANIPULATOR FOR POLYNOMIALS M.S. Thesis [PASCAL-MP MANIPULADOR ALGEBRICO E NUMERICO DE POLINOMIOS]
Jose Carlos Lombardi Aug. 1984 86 p refs In PORTUGUESE; ENGLISH summary
(INPE-3229-TDL/176) Avail: NTIS HC A05/MF A01

The subject of this work is to make possible, in a simple and efficient way, the algebraic and numerical manipulations of multiple variables and real coefficients polynomials. It is a programming language composed of a subset of PASCAL language added of special statements for algebraic manipulation of multiple variables polynomials, which can operate in two manners, algebraic and numeric, without leaving the user percept these changes. Its main application is the solution of problems that, after the algebraic operations be realized, numerical operations are needed, or in iteractive problems composed of algebraic and numerical operations. Author

N85-11563# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DESCRIPTION OF THE LOGICAL SUPPORT FOR AN IMAGE PROCESSING SYSTEM [DESCRICAO DO SUPORTE LOGICO DE UM SISTEMA DE PROCESSAMENTO DE IMAGENS]
Flavio R. D. Velasco, Ubirajara M. B. deLima, Jony Santellano, and Julia L. deOliveira Jun. 1983 16 p refs In PORTUGUESE; ENGLISH summary
(INPE-2783-PRE/349) Avail: NTIS HC A02/MF A01

Satellites for Earth observation gather and transmit data usually in the form of digital images. Image processing systems are computer systems that help in the extraction of information from these images. The software of one such system (SITIM) which is based on a Brazilian computer is described. Author

N85-11564# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SITIM SYSTEM: OBJECT MANAGER MODULE [SISTEMA SITIM - MODULO GERENCIADOR]
Flavio Roberto Dias Velasco and Ubirajara Mauricio Barsotti deLima Sep. 1984 40 p In PORTUGUESE; ENGLISH summary
(INPE-3284-NTE/226) Avail: NTIS HC A03/MF A01

The SITIM (Sistema Interativo de Tratamento de Imagens-Interactive Image Processing System) is a computational system for image stoarge and manipulation. The SITIM's software is organized in four modules: Supervisor, Object Manager, Applications, and Subroutine Library. The Object manager module is specifically addressed. It is a collection of routines responsible for access to the objects (images, for instance) processed by SITIM as well as to the information related to these objects. Author

N85-11565# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SITIM SYSTEM: SUPERVISOR UTILIZATION [SISTEMA SITIM - UTILIZACAO DO SUPERVISORIO]
Ubirajara M. B. Lima Sep. 1984 25 p refs In PORTUGUESE; ENGLISH summary
(INPE-3267-NTE/224) Avail: NTIS HC A02/MF A01

During the development of the softwae of SITIM (Sistema Interativo de Tratamento de Imagens - Interactive Image Processing System), the need for a supervisor to permit users and programmers to employ the system was noted. Thereby a provisional supervisor that was improved to be considered an alternative supervisor was developed. The basic concepts, general structure, and use of this supervisor are described. Author

N85-11566# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
UTILIZATION OF INTERPOLATION AND TRANSFORMATION FOR THE COMPRESSION OF DIGITAL IMAGE DATA [UTILIZACAO DE INTERPOLACAO E TRANSFORMACAO PARA COMPRESSAO DE IMAGENS DIGITAIS]
Ubirajara M. B. Lima Apr. 1984 35 p refs In PORTUGUESE; ENGLISH summary Presented at the 6th Congr. Nacl. de Mat. Apl. e Computacional, 26-30 Set. 1983 Original doc. contains color illustrations
(INPE-3061-PRE/479) Avail: NTIS HC A03/MF A01

When compressing digital image data, many methods may be used. Among these two may be recalled: the sampling of picture elements followed by reconstruction by interpolation; and the transformation of a set a picture elements followed by the selection of the resultant coefficients and the picture reconstruction through inverse transformation. A method combining these two is developed, and analyzed. Author

N85-11567# Comptroller General of the United States, Washington, D.C.
CONTRACTING FOR COMPUTER SOFTWARE DEVELOPMENT: SERIOUS PROBLEMS REQUIRE MANAGEMENT ATTENTION TO AVOID WASTING ADDITIONAL MILLIONS
9 Nov. 1979 94 p
(FGMSD-80-4) Avail: NTIS HC A05/MF A01

The feasibility of using private firms to develop software for federal agencies is examined. GAO found that too many contracts for software development experience large cost overruns, lengthy delays, and dissatisfaction with the final product. Major causes of problems in contract software development are discussed. Conclusions and recommendations for improving software contracts are detailed. E.R.

N85-11568# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
PROGEN: AN INCREMENTAL PROGRAMMING ENVIRONMENT
Desire Vermaak Jul. 1983 26 p refs
(NRIMS-TWISK-315) Avail: NTIS HC A03/MF A01

In an effort to create a programmer-friendly environment for a block-structured strong-typed language, PROGEN is designed and implemented as an incremental programming environment for the language PROLAN. Compilation of the program text is done during the edit phase, which is aided by means of templates. Debugging is done interactively during the interpretation of the program. The program text is manipulated internally as a syntactic tree representation, while all declarations are stored in a dictionary. Author

N85-11569*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARALLEL TRIANGULARIZATION OF SUBSTRUCTURED FINITE ELEMENT PROBLEMS Final Report
Michael R. Leuze (Vanderbilt Univ.) Sep. 1984 20 p refs
(Contract NAS1-17130; Grant NSF MCS-83-05693)
(NASA-CR-172466; ICASE-84-47; NAS 1.26:172466) Avail: NTIS HC A02/MF A01 CSCL 09B

Much of the computational effort of the finite element process involves the solution of a system of linear equations. The coefficient matrix of this system, known as the global stiffness matrix, is symmetric, positive definite, and generally sparse. An important technique for reducing the time required to solve this system is substructuring or matrix partitioning. Substructuring is based on the idea of dividing a structure into pieces, each of which can then be analyzed relatively indepenently. As a result of this division, each point in the finite element discretization is either interior to a substructure or on a boundary between substructures. Contributions to the global stiffness matrix from connections between boundary points from the K(bb) matrix are reported. The triangularization of a general K(bb) matrix on a parallel machine is specifically discussed. Author

N85-11570*# Computer Sciences Corp., Hampton, Va.
SMP: A SOLID MODELING PROGRAM
Donald P. Randall, Kennie H. Jones, William H. vonOfenheim, and Raymond L. Gates Hampton, Va. NASA. Langley Research Center Nov. 1984 138 p refs
(Contract NAS1-16078)
(NASA-CR-172473; NAS 1.26:172473; TAO-34100) Avail: NTIS HC A07/MF A01 CSCL 09B

A prototype solid modeling program, SMP, developed by CSC for Langley Research Center (LaRC) is documented in this paper. The SMP software is employed by the System and Experiments Branch (SEB) of the Space Systems Division (SSD) for preliminary space station design, but is intended as a general purpose tool. The SMP document provides details concerning: the basic geometric modeling primitives and associated operators, the data representation scheme utilized to structure the geometric model, the available commands for both editing and displaying the solid model, the interactive user interface and the input/output interfaces to external software, and the utility of the package in the LaRC computing environment. The document is sufficiently detailed to serve both as a user's guide and reference manual. B.W.

N85-11571# Institute for Defense Analyses, Arlington, Va.
SOFTWARE ENGINEERING ENVIRONMENTS FOR MISSION CRITICAL APPLICATIONS: STARS ALTERNATIVE PROGRAMMATIC APPROACHES Final Report, Dec. 1983 - Aug. 1984
R. A. DeMillo, A. B. Marmor-Squires, S. T. Redwine, Jr., and W. E. Riddle Aug. 1984 155 p
(Contract MDA903-84-C-0031)
(AD-A145285; AD-E500677; IDA-P-1789; IDA/HQ-84-28866) Avail: NTIS HC A08/MF A01 CSCL 09/2

Central to the STARS (Software Technology for Adaptable and Reliable Systems) Program is automated software engineering environment(s) (SEE) to provide software development and in-service support for DOD systems with mission critical computer resources (MCCR). This paper briefly describes seven previously proposed alternatives for producing SEEs in the near-, mid-, and long-terms and highlights the advantages and disadvantages of each alternative. It reviews some key issues for selecting alternatives or combinations of alternatives including DOD's needs, the available technical opportunities and choices, the means used to obtain environment(s), and the costs. This paper also makes recommendations for STARS decision making, suggesting an exploration and decision process as well as a number of possible activities. In depth descriptions of the seven previously proposed alternatives appear in an Appendix. GRA

N85-11572# Army Electronic Proving Ground, Fort Huachuca, Ariz.
PROGRAM FLOW ANALYZER, VOLUME 1 Final Methodology Investigation Report
L. F. Claudio Jan. 1984 29 p
(DA Proj. IT6-65702-D-625)
(AD-A145320; USAEPG-FR-1263-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Program Flow Analyzer (PFA) methodology investigation developed a language-independent, automated software analysis system which processes software source code to identify and measure attributes of software quality. The investigation included a survey of various software assessment metrics suitable for automated implementation. Application of the PFA methodology has served to validate the feasibility of a language-independent software assessment tool for a multilingual test environment. GRA

N85-11573# Mitre Corp., Bedford, Mass.
DESCRIPTION OF THE SOFTWARE ACQUISITION PROCESS (SWAP) MODEL Final Report
O. Shapiro Aug. 1984 202 p
(Contract F19628-82-C-0001; AF Proj. 6810)
(AD-A145413; MTR-9005; ESD-TR-84-151) Avail: NTIS HC A10/MF A01 CSCL 09/2

The software Acquisition Process (SWAP) Model is a software cost and schedule estimating tool that operates by simulating the acquisition process. Its current implementation is tailored to reflect the Air Force 800 series regulations that apply to the Full Scale Development phase of the system acquisition process. This document details the acquisition depicted by the Model, the concepts underlying its simulation, its current status, and instructions for operating the Model. Author (GRA)

N85-11574# Maryland Univ., College Park. Center for Automation Research.
PARALLEL SEARCHING AND MERGING ON ZMOB
S. Kasif Jun. 1984 41 p
(Contract F49620-83-C-0082)
(AD-A145424; CAR-TR-64; CSC-TR-1405; AFOSR-84-0746TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

One of the most difficult issues that must be addressed when studying a class of parallel algorithms is the problem of choosing a model that captures the inherent difficulty of implementing these algorithms on a multiprocessor architecture. Shared memory models have proven to be an effective tool for deriving lower

bounds on the complexity of comparison problems. A model for parallel computation that is strictly weaker than the shared memory models is described. The model is based on an actual machine currently being constructed (ZMOB). We examine the communication facilities available in the model and show that lower bounds for merging and searching on shared memory models are attainable (within a constant). GRA

N85-11575# Institute for Defense Analyses, Alexandria, Va.
DOD RELATED SOFTWARE TECHNOLOGY REQUIREMENTS, PRACTICES, AND PROSPECTS FOR THE FUTURE Final Report, Feb. - Jun. 1984
S. T. Redwine, Jr., L. G. Becker, A. B. Marmor-Squires, R. J. Martin, and S. H. Nash Jun. 1984 351 p
(Contract MDA903-84-C-0031)
(AD-A145493; AD-E500678; IDA-P-1788; IDA/HQ-84-28841) Avail: NTIS HC A16/MF A01 CSCL 09/2

This study investigates future DOD software requirements, current practices and approaches to software development, and the time it takes a software technology innovation to become widely used; and offers a glimpse of future possibilities in software technology. GRA

N85-11576# Army Electronic Proving Ground, Fort Huachuca, Ariz.
PROGRAM FLOW ANALYZER, VOLUME 2 Final Methodology Investigation Report
L. F. Claudio Aug. 1984 145 p 3 Vol.
(DA Proj. 1T6-65702-D-625)
(AD-A145521; USAEPG-FR-1263-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 09/2

This specification establishes the performance, design, development, and test requirements for the Program Flow Analyzer (PFA) system. PFA is a software analysis system that shall interpret and translate source language programs into attributes which characterize the design of the programs. The attributes shall then be processed to provide an analysis of the program based on selected PFA requirements. This specification provides the user requirements for a software analysis tool to support the software development process. Many of these requirements have not matured to the point of practical application. This document should serve as a living document to evolve as software engineering matures. GRA

N85-11577# Army Electronic Proving Ground, Fort Huachuca, Ariz.
PROGRAM FLOW ANALYZER, VOLUME 3 Final Methodology Investigation Report
L. F. Claudio Aug. 1984 98 p 3 Vol.
(DA Proj. 1T6-65702-D-625)
(AD-A145522; USAEPG-FR-1263-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

Quantitative techniques for describing and evaluating software systems have been developed on a largely ad hoc basis. The need for control over the software development process has created a software engineering discipline whose purpose is to establish operational procedures for the development of quality software. Unfortunately, techniques for predicting and evaluating software quality and performance are just emerging for practical application: Computer science and software engineering need metrics to help quantify the various aspects of software development. This report summarizes and explains some metrics from current literature. The emphasis of this report is the review of software metrics as they may be applied to the maintainability, supportability, and testability of software. GRA

N85-11578# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EFFECTS OF ALTERNATIVE CHROMATIC MIXED GRAPHICS DISPLAYS IN DECISION SUPPORT SYSTEMS Ph.D. Thesis
M. S. McCully May 1984 309 p
(AD-A145561; AFIT/CI/NR-84-46D) Avail: NTIS HC A14/MF A01 CSCL 09/2

The relative effectiveness on decision makers' performance when integrating color functionally into the mixed graphics of a Decision Support System (DSS) was investigated. The method of research was a laboratory approach using a man-machine experiment. The key factors of the experimental design were determined by the components of Mason and Mitroff's (1973) definition of a DSS. The decision makers had academic engineering backgrounds. The performance measures included 3 levels of decision time and 12 levels of decision quality. Seven characteristics of decision makers were included: age, sex, college level and experience, attitude toward the computer, experience with computer, and video games. Five alternatives of colors were functionally integrated into mixed graphics (test and graphics) displays: four chromatic and one monochrome. The decision represented a class of problems which were structured and had deterministic data. The interface employed was computer generated hardcopy. The organizational context was managerial control of resources. GRA

N85-11579# University of Southern California, Los Angeles. Dept. of Computer Science.
YEARLY REPORT FOR PROGRAMMING PRODUCTIVITY ENHANCEMENT BY THE USE OF APPLICATION GENERATORS Interim Report, 1 Jun. 1983 - 31 May 1984
E. Horowitz Aug. 1984 5 p
(Grant AF-AFOSR-0232-82)
(AD-A145623; AFOSR-84-0813TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

During this period the investigator produced three papers with titles, AdaRel - A relational extension of Ada, The design of office information systems, and High-level input-output facilities in database programming language. Author (GRA)

N85-11580# State Univ. of New York, Stony Brook. Dept. of Computer Science.
[RESEARCH ON DISTRIBUTED LANGUAGES AND ALGORITHMS] Summary Report, 15 Jun. 1983 - 14 Jun. 1984
A. J. Bernstein Aug. 1984 5 p
(Grant AF-AFOSR-0197-81)
(AD-A145661; AFOSR-84-0831TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research performed under this grant was concerned with distributed languages and algorithms. GRA

N85-11581# California Inst. of Tech., Pasadena.
CONCURRENT PROCESSING AND THE DECOMPOSITION OF PROBLEMS Annual Report
Geoffrey Fox 21 Jun. 1984 9 p
(Contract DE-AT03-83ER-13118)
(DE84-015285; DOE/ER-13118/T1) Avail: NTIS HC A02/MF A01

Work done in the general area of concurrent processing for scientific and engineering computation is described. The work includes developing concurrent algorithms and running them on a 64 node hypercube machine to solve significant scientific problems. Another major aspect of the research involves developing the necessary hardware and system software. The different components of the project are examined. DOE

N85-11582# Sandia Labs., Albuquerque, N. Mex.
TRAJECTORY ESTIMATION USING COMBINED TIME-OF-ARRIVAL AND VELOCITY MEASUREMENTS
E. A. Aronson Jul. 1984 48 p refs
(Contract DE-AC04-76DP-00789)
(DE84-015872; SAND-84-0793) Avail: NTIS HC A03/MF A01

A method is given for estimating the trajectory of an object using combined time of arrival (TOA) and velocity (Doppler) measurements. The resultant trajectory yields both position and velocity directly; that is, without differentiation. Smoothness of the trajectory can be adjusted by choosing appropriate weights. An analysis is given of the statistical errors in the trajectory due to measurement errors. A FORTRAN77 code is also provided. DOE

N85-11583# Argonne National Lab., Ill. Mathematics and Computer Science Div.

RESEARCH TOPICS: MULTIPROCESSING ALGORITHMS FOR COMPUTATIONAL LOGIC
E. L. Lusk and R. A. Overbeek Jul. 1984 13 p refs
(Contract W-31-109-eng-38; Grant NSF MCS-82-07496)
(DE84-015500; ANL/MCS-TM-31) Avail: NTIS HC A02/MF A01

It is becoming apparent that MIMD multiprocessors will become widely available over the next few years. The potential for creating high-performance computational logic systems introduces a number of interesting questions. Some specific problems in the area of multiprocessing algorithm design for automated reasoning systems are identified. DOE

N85-11584# Los Alamos Scientific Lab., N. Mex.
SMILE USER'S GUIDE: A MACRO PREPROCESSOR FOR EXTENDING FORTRAN
L. H. Lowe Jun. 1984 21 p refs
(Contract W-7405-eng-36)
(DE84-015984; LA-9862-M) Avail: NTIS HC A02/MF A01

SMILE is a precompiler that translates programs from a macro language into FORTRAN. It is available on the VAX-11 VMS (Virtual Memory System), the Cray-1 CTSS (Cray Time-Sharing System), and the CDC 7600 LTSS (Livermore Time-Sharing System). SMILE has supported and will continue to support the major FORTRAN compilers in use at Los Alamos. A macro library file may contain command predefinitions for a family of programs or a program being worked on by a number of coders. A selective compilation feature allows the selection of the appropriate code for each supported compiler. Rather efficient code for all systems results from an optional cleanup feature. Additional language features include multiple statements, symbolic labels, and byte support. DOE

N85-11585# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
PROGRAMMER'S GUIDE FOR ASKF 77: A TOOL FOR PROGRAMMING OF DIALOGS IN FORTRAN AND PASCAL
Lena Joensson Jun. 1984 38 p refs In SWEDISH; ENGLISH summary
(FOA-C-30366-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01

The ASKF 77 subroutine package which supports programming of dialogs, primarly for scientific applications is introduced. The main task is to facilitate conversational input of scalars, arrays, and strings. This involves handling of guide texts, default values, and input checks. The user can ask for help information, give escape and stop commands, and save the conversation on a file for later input through a ASKF 77 package. The ASKF 77 is implemented on DEC-10 and VAX 11/750 systems. The subroutine package can be called in FORTRAN 77 and PASCAL. Author (ESA)

N85-11373# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
HARDWARE AND SOFTWARE SELECTION FOR EXPERIMENTAL MODAL ANALYSIS
C. W. deSilva *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 3 Aug. 1984 p 3-10 refs (For primary document see N85-11372 02-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

62 COMPUTER SYSTEMS

Includes computer networks.

N85-11586*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARALLEL, ITERATIVE SOLUTION OF SPARSE LINEAR SYSTEMS: MODELS AND ARCHITECTURES Final Report
Daniel A. Reed (Illinois Univ., Urbana) and Merrell L. Patrick (Duke Univ., Durham, N.C.) Aug. 1984 47 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172457; ICASE-84-35; NAS 1.26:172457) Avail: NTIS HC A03/MF A01 CSCL 09B

A model of a general class of asynchronous, iterative solution methods for linear systems is developed. In the model, the system is solved by creating several cooperating tasks that each compute a portion of the solution vector. A data transfer model predicting both the probability that data must be transferred between two tasks and the amount of data to be transferred is presented. This model is used to derive an execution time model for predicting parallel execution time and an optimal number of tasks given the dimension and sparsity of the coefficient matrix and the costs of computation, synchronization, and communication. The suitability of different parallel architectures for solving randomly sparse linear systems is discussed. Based on the complexity of task scheduling, one parallel architecture, based on a broadcast bus, is presented and analyzed. R.J.F.

N85-11587*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUFFLE-EXCHANGES ON AUGMENTED MESHES Final Report
Shahid H. Bokhari (Univ. of Engineering and Technology, Lahore, Pakistan) Oct. 1984 14 p refs
(Contract NAS1-17070)
(NASA-CR-172476; ICASE-84-54; NAS 1.26:172476) Avail: NTIS HC A02/MF A01 CSCL 09B

A mesh connected array of size N = two to the Kth power, K an integer, can be augmented by adding at most one edge per node such that it can perform a shuffle-exchange of size N/2 in constant time. A shuffle-exchange of size N is performed on this augmented array in constant time. This is done by combining the available perfect shuffle of size N/2 with the existing nearest neighbor connections of the mesh. By carefully scheduling the different permutations that are composed in order to achieve the shuffle, the time required is reduced to 5 steps, which is optimal for this network. M.A.C.

N85-11588# Naval Postgraduate School, Monterey, Calif.
MULTIPLEXING THE ETHERNET INTERFACE AMONG VAX/VMS USERS M.S. Thesis
A. K. Sakellaropoulos and I. K. Kidoniefs Dec. 1983 155 p
(AD-A145539; AD-E000593) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis focuses on the multiplexing of Ethernet interface among VAX 11/780 users. Since there is only the one channel that connects VAX 11/780 system to Ethernet Local Area Network, multiplexing of the NI1010 Unibus Ethernet Communication Controller is necessary in order to service multiple VAX users concurrently via Ethernet. This thesis describes a time division multiplexing of NI1010 controller, which can serve up to nine (9) separate VAX users. The developed software enables those users to communicate in any combination with one or more computer systems, which are connected to Ethernet as well. Two Microcomputer Development Systems (MDS) and VAX/VMS system were used for the implementation and testing of the project. The software is designed in such a way that those MDS's act very much like virtual VAX/VMS terminals. The whole system can easily be expanded to serve more than nine users. GRA

N85-11589# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PARAMETRIC ANALYSIS FOR GENERALIZED NETWORK FLOW PROBLEMS Ph.D. Thesis
M. E. Baum May 1984 235 p
(AD-A145558; AFIT/CI/NR-84-38D) Avail: NTIS HC A11/MF A01 CSCL 12/1

A generalized network flow problem can be efficiently solved with state of the art computer codes. However, because of the uncertainty of inaccuracy of initial problem input data, the solution found may need reexamination. Parametric analysis allows the management scientist to vary any of the right-hand side restrictions, either external flow or capacities, and determine the series of bases so the solution remains optimal. This study uses the special structural properties of the generalized network flow problem to

iteratively change the network flows, until no further changes in the basis can be made. Additionally, two dual-incremental flow algorithms based on parametric analysis are developed. A series of test problems were randomly generated and computational results were compared to two primal generalized network computer codes and a published dual incremental computer code.
Author (GRA)

N85-11590# Oakland Univ., Rochester, Mich. School of Engineering.
FAULT TOLERANT COMPUTING RESEARCH Final Report, 1 Jul. 1980 - 30 Jun. 1983
D. K. Pradhan Sep. 1983 12 p
(Grant AF-AFOSR-0217-80)
(AD-A145640; AFOSR-84-0841TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

During this reporting period, three main topics were investigated: (1) Design of fault tolerant computers using read-only memories as basic building blocks; (2) Design of programmable logic arrays and sequential networks for testability; and (3) Design of fault tolerant multiprocessor network architectures. Some titles of the resulting papers are: Sequential network design using extra inputs for fault detection; A class of unidirectional error correcting codes; A uniform representation of permutation networks used in memory processor interconnections; and A fault tolerant communication architecture for distributed systems. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N85-11591# Royal Aircraft Establishment, Farnborough (England).
THE MICROPROCESSOR CONTROL OF A MOTOR-ALTERNATOR
D. Bird Nov. 1983 38 p
(Contract DGME-7809/5179/1)
(RAE-TM-NAV-ENG-1023(L); BR91100) Avail: Issuing Activity

Voltage and frequency control of a dc motor coupled to a single phase alternator (2 kW) using a microprocessor (BBC Micro) is described. Voltage and frequency can be simultaneously controlled, with sampling and output updating carried out on a cycle-by-cycle basis. The speed of response of the control enables the outputs to depend on the load/machine parameters, rather than partly depend on the speed of controller response. Results show that microprocessors are eminently suitable for both frequency and voltage control, allowing greater flexibility and programmable responses to be obtained. Author (ESA)

N85-11592# Denver Research Inst., Colo.
ARTIFICIAL INTELLIGENCE IN MAINTENANCE: PROCEEDINGS OF THE JOINT SERVICES WORKSHOP Interim Report, Sep. 1982 - Sep. 1983
Jun. 1984 525 p Workshop held in Boulder, Colo., 4-6 Oct. 1983
(Contract F33615-82-C-0013)
(AD-A145349; AFHRL-TR-84-25) Avail: NTIS HC A22/MF A01 CSCL 06/4

This report presents the proceedings of a workshop on artificial intelligence (AI) in maintenance that was sponsored by 7 Department of Defense agencies. The workshop, entitled Joint Services Workshop on Artificial Intelligence in Maintenance, was held October 4-6, 1983 in Boulder, Colorado. The primary objective of the workshop was to provide an exchange of technical information among personnel involved in ongoing research and development in artificial intelligence applicable to automatic testing, maintenance aiding, and maintenance training. A second objective was to identify both theoretical and practical applications issues in the use of AI in maintenance. This report is organized into four sections: Overview; The Science; Department of Defense Programs and Projects; and Commercial and Industrial Development Projects. The material in the report includes contributed papers, significant papers previously published, and edited transcripts of presentations made at the workshop. For individual titles, see N85-11593 through N85-11627.

N85-11593# Office of the Secretary of Defense, Washington, D.C.
THE NEED FOR IMPROVEMENTS IN WEAPON SYSTEM MAINTENANCE: WHAT CAN AI (ARTIFICIAL INTELLIGENCE) CONTRIBUTE?
M. McGrath *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 15-22 (For primary document see N85-11592 02-63)
(AD-P003913) Avail: NTIS HC A22/MF A01 CSCL 05/1

This article discusses how artificial intelligence applications can contribute to improvements in weapon system maintenance. GRA

N85-11594# Rome Air Development Center, Griffiss AFB, N.Y.
ARTIFICIAL INTELLIGENCE APPLICATIONS TO MAINTENANCE
A. Coppola *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 23-44 (For primary document see N85-11592 02-63)
(AD-P003914) Avail: NTIS HC A22/MF A01 CSCL 05/1

The maintenance of modern military systems employs a variety of automation. Built-In-Test provides on-line fault detection and some isolation, Automatic Test Equipment is indispensable at intermediate and depot repair stations, and automated maintenance aids and trainers abound. These developments were designed to speed maintenance and to compensate for declining skill levels in the maintenance force. They are currently far from satisfactory. Modern maintenance is characterized by excessive false alarms and unnecessary removals at all levels of maintenance. The results of these deficiencies are long maintenance times, resources wasted in unnecessary for inefficient maintenance actions, and systems out of action which need not be. Correcting these problems would therefore provide both an economic advantage and a force multiplier. To create quantum improvements in maintenance will require the application of radical changes to the technology. One possibility is the application of Artificial Intelligence (AI) techniques to maintenance. AI is beginning to see application to practical problems in many disciplines, and hence is potentially capable of relatively rapid implementation into military systems. At present, DoD efforts in applying AI to maintenance are small and exploratory. The task of the Artificial Intelligence Applications committee was to examine the opportunities for applying AI to maintenance, assess the costs, risks, and development time required, and provide recommendations to the DoD for action. GRA

N85-11595# Navy Center for Applied Research in Artificial Intelligence, Washington, D.C.
ON APPLYING AI (ARTIFICIAL INTELLIGENCE) TO MAINTENANCE AND TROUBLESHOOTING
K. DeJong *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 45-54 (For primary document see N85-11592 02-63)
(AD-P003915) Avail: NTIS HC A22/MF A01 CSCL 05/1

This article describes artificial intelligence applications to maintenance and troubleshooting in the Navy. GRA

N85-11596# Naval Electronic Systems Command, Washington, D. C.
AN OVERVIEW OF THE JOINT LOGISTICS COMMANDERS AUTOMATIC TEST EQUIPMENT PANEL
P. Gross *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 55-66 (For primary document see N85-11592 02-63)
(AD-P003916) Avail: NTIS HC A22/MF A01 CSCL 05/1

The duties and organization of the joint logistics commanders automatic test equipment panel are presented. Improved methods of equipment testing with an increase in maintenance quality are examined. M.A.C.

N85-11597# Office of Naval Research, Arlington, Va.
OVERVIEW OF TRAINING AND AIDING
H. Halff *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 67-81 (For primary document see N85-11592 02-63)
(AD-P003917) Avail: NTIS HC A22/MF A01 CSCL 05/1

This article discusses the role that people play in maintaining systems and about psychological research which addresses that role. GRA

N85-11598# Xerox Palo Alto Research Center, Calif.
AI (ARTIFICIAL INTELLIGENCE) APPROACHES TO TROUBLE-SHOOTING
J. DeKleer *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 83-95 (For primary document see N85-11592 02-63)
(AD-P003918) Avail: NTIS HC A22/MF A01 CSCL 05/1

Technological machines break faster than we can fix them. From that keen insight, one can make further observations about the two ways to fix them. Right now, both of these approaches don't work very well. Is there a common theory of troubleshooting underlying these two approaches? To put the question another way: Is the theory of troubleshooting underlying human training and human aiding and doing maintenance and different from the theory underlying computer-based test equipment? The argument is often made that there is a fundamental difference because inference is cheap for computers. This, however, remains to be seen. The speaker takes as an objective getting the best computer-based troubleshooting we can. GRA

N85-11599# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
DIAGNOSIS BASED ON DESCRIPTION OF STRUCTURE AND FUNCTION
R. Davis, H. Shrobe, W. Hamscher, K. Wieckert, and M. Shirley *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 97-108 (For primary document see N85-11592 02-63)
(AD-P003919) Avail: NTIS HC A22/MF A01 CSCL 05/1

While expert systems have traditionally been built using large collections of rules based on empirical associations, interest has grown recently in the use of systems that reason from representations of structure and function. Our work explores the use of such models in troubleshooting digital electronics. We describe our work to date on (i) a language for describing structure, (ii) a language for describing function, and (iii) a set of principles for troubleshooting that uses the two descriptions to guide its investigation. In discussing troubleshooting we show why the traditional approach -- test generation -- solves a different problem and we discuss number of its practical shortcomings. We consider next the style of debugging known as discrepancy. Further exploration, however, demonstrates that in this standard from this approach is incapable of dealing with commonly known classes of faults. We explain the shortcoming as arising from a number of interesting assumptions made implicity when using the technique. In discussing how to repair the problems uncovered, we argue for the primacy of models of causal interaction, rather than the traditional fault models. We point out the importance of making these models explicit, separated from the troubleshooting mechanism, and retractable in much the same sense that inferences are retracted in current systems. We report on progress to date in implementing this approach. Author (GRA)

N85-11600# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
DIAGNOSIS VIA CAUSAL REASONING: PATHS OF INTERACTION AND THE LOCALITY PRINCIPLE
R. Davis *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 109-115 (For primary document see N85-11592 02-63)
(AD-P003920) Avail: NTIS HC A22/MF A01 CSCL 05/1

Interest has grown recently in developing expert systems that reason from first principle, i.e., capable of the kind of problem solving exhibited by an engineer who can diagnose a malfunctioning device by reference to its schematics, even though he may never have seen that device before. In developing such a system for troubleshooting digital electronics, we have argued for the importance of pathways of causal interaction as a key concept. We have also suggested using a layered set of interaction paths as a way of constraining and guiding the diagnostic process. We report here on the implementation and use of these ideas. We show how they make it possible for our system to generate a few sharply constrained hypotheses in diagnosing a bridge fault. Abstracting from this example, we find a number of interesting general principles at work. We suggest that diagnosis can be viewed as the interaction of simulation and inference and we find that the concept of locality proves to be extremely useful in understanding why bridge faults are difficult to diagnose and why multiple representations are useful. Author (GRA)

N85-11601# Ohio State Univ., Columbus. Dept. of Computer and Information Science.
A REPRESENTATION FOR THE FUNCTIONING OF DEVICES THAT SUPPORTS COMPILATION OF EXPERT PROBLEM SOLVING STRUCTURES: AN EXTENDED SUMMARY
V. S. Moorthy and B. Chandrasekaran *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 117-129 (For primary document see N85-11592 02-63)
(AD-P003921) Avail: NTIS HC A22/MF A01 CSCL 05/1

Most of the diagnostic systems that have been developed in medicine as well as other domains can properly be called compiled knowledge systems in the sense that the knowledge base contains the relationships between symptoms and malfunction hypotheses in some form. However, often in human reasoning, an expert's knowledge of how the device functions is used to generate new relationships during the reasoning process. This deeper level representation which can be processed to yield more compiled diagnostic structures is the concern of this paper. Using the example of an household buzzer, this paper shows what a functional representation of a device looks like. It also indicates the nature of the compilation process that can produce the diagnostic expert from this deeper representation. GRA

N85-11602# Ohio State Univ., Columbus. Dept. of Computer and Information Science.
APPLICATION OF THE CSRL LANGUAGE TO THE DESIGN OF EXPERT DIAGNOSIS SYSTEMS: THE AUTO-MECH EXPERIENCE
M. C. Tanner and T. Bylander *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 131-152 (For primary document see N85-11592 02-63)
(Grant AF-AFOSR-0255-82)
(AD-P003922) Avail: NTIS HC A22/MF A01 CSCL 05/1

Auto-Mech is an expert system which diagnoses automobile fuel systems. Its organization and strategies are patterned after MDX, an expert diagnosis system. The problems that these systems are able to diagnose are represented as nodes within a hierarchy. Each node has knowledge about what nodes to consider next. This approach is intended to be a domain-independent methodology for providing focused problem solving and for localizing knowledge in a conceptually relevant manner. Auto-Mech is implemented in a recently developed language called CSRL, which is specifically intended for building diagnostic expert systems. This paper describes Auto-Mech and discusses why the MDX approach and CSRL were useful in developing Auto-Mech, and where some difficulties were encountered. GRA

N85-11603# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
AN EXPERT SYSTEM FOR REPRESENTING PROCEDURAL KNOWLEDGE
M. Georgeff *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 153-170 (For primary document see N85-11592 02-63)
(AD-P003923) Avail: NTIS HC A22/MF A01 CSCL 05/1

Development of effective automatic systems for fault isolation and diagnosis requires reasoning about sequences of tests and

actions. Unfortunately, traditional expert systems are not well suited to representing such procedural knowledge. In this paper, a scheme is presented that allows the explicit representation of both declarative and procedural knowledge with a unified framework, yet retains all the desirable properties of expert systems such as flexibility, explanatory capability and extendibility. In particular, the scheme allows any heuristic declarative knowledge that maintenance engineers may possess to be integrated easily and uniformly with the strong procedural methods of maintenance plans. Domain-specific metalevel knowledge can also be represented within the same formalism. A simple version of the scheme has been fully implemented and applied to the domain of automobile-engine fault diagnosis. Author (GRA)

N85-11604# Battelle Memorial Inst., Geneva (Switzerland).
FAILURE DETECTION PROCESSES BY PATTERN RECOGNITION AND EXPERT SYSTEMS
L. F. Pau *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 171-180 (For primary document see N85-11592 02-63)
(AD-P003924) Avail: NTIS HC A22/MF A01 CSCL 05/1

This paper analyses the failure diagnostic processes involved in automatic testing, automatic imaging inspection and more general technical diagnostic systems. It is shown how properly selected pattern recognition methods, artificial intelligence procedures, and relational data base search schemes, must be assembled to achieve operational requirements which these diagnostic systems must meet. This paper will indicate some basic design and selection criteria, and outline how it can be simplified in a number of practical cases. It will also describe the corresponding failure diagnostic system architecture. GRA

N85-11605# Stanford Univ., Calif.
GUIDON
W. J. Clancey *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 181-188 (For primary document see N85-11592 02-63)
(AD-P003925) Avail: NTIS HC A22/MF A01 CSCL 09/2

GUIDON is an intelligent computer-aided instructional program for teaching diagnosis, such as medical diagnosis. The program is general. Without reprogramming, the program can discuss with a student any diagnostic problem that it can solve on its own. Moreover, by substituting problem solving knowledge from other domains, the program can immediately discuss problems in those domains. This power derives from the use of Artificial Intelligence methods for representing both subject material and knowledge about how to teach. These are represented independently, so the teaching knowledge is general. There are teaching rules and procedures for: determining what the student knows, responding to his partial solution, providing hints, and opportunistically interrupting to test his understanding. Experience with GUIDON reveals the importance of separating out casual and strategic knowledge in order to explain diagnostic rules and to teach a reasoning approach. These lessons are now guiding the development of new representations for teaching. Author (GRA)

N85-11606# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DESIGNING AN EXPERT SYSTEM FOR TRAINING AUTOMOTIVE ELECTRICAL TROUBLESHOOTING
W. Feurzeig and J. Frederiksen *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 189-192 (For primary document see N85-11592 02-63)
(AD-P003926) Avail: NTIS HC A22/MF A01 CSCL 05/1

Two key issues in the design and development of expert systems for maintenance training are the choice of an appropriate expert model and the function of the expert in instruction. We are confronting these issues in instructional research involving the design of an expert instructional system for automotive electrical troubleshooting. In studying expert troubleshooters and in examining troubleshooting procedures used in the military, we have encountered three distinctly different types of expertise. Each of these requires different forms of knowledge and produces qualitatively different troubleshooting behaviors. One kind of expert has established a large repertoire of symptom-fault associations through extensive experience in troubleshooting. Another kind of mechanic utilizes fixed troubleshooting procedures from shop manuals and various maintenance aids. A third kind of expert does extensive inferencing in attempting to diagnose faults. GRA

N85-11607# Georgia Inst. of Tech., Atlanta.
MODELS OF NATURAL INTELLIGENCE IN FAULT DIAGNOSIS TASKS: IMPLICATIONS FOR TRAINING AND AIDING OF MAINTENANCE PERSONNEL
W. B. Rouse *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 193-213 (For primary document see N85-11592 02-63)
(AD-P003927) Avail: NTIS HC A22/MF A01 CSCL 05/10

This article discusses natural intelligence as opposed to artificial intelligence. The author looks at human behavior and tries to present a summary of some work done attempting to understand human intelligence and abilities in problem solving. Particularly, he looks at human problem solving in diagnostic situations in both maintenance and operational environments. GRA

N85-11608# University of Southern California, Los Angeles. Behavioral Technology Labs.
A GENERALIZED MODEL OF FAULT-ISOLATION PERFORMANCE
D. M. Towne *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 215-225 (For primary document see N85-11592 02-63)
(Contract N00014-80-C-0493)
(AD-P003928) Avail: NTIS HC A22/MF A01 CSCL 09/2

This paper briefly summarizes a computer-based model of corrective maintenance performance, developed to generate realistic fault-isolation behavior. The model forms the core of a maintainability projection system which quantifies the times to isolate and repair a sample of faults in an existing or planned equipment. Since the projections are a direct result of the system design, the model can be used to assess the maintenance implications of design decisions concerning internal organization, packaging and modularization, and selection of external indicators, controls, and test points. GRA

N85-11609# Arizona Univ., Tucson. Dept. of Psychology.
THE PSYCHOLOGY OF TECHNICAL DEVICES AND TECHNICAL DISCOURSE
D. E. Kieras *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 227-255 (For primary document see N85-11592 02-63)
(Contracts N00014-81-C-0699; N00014-83-K-0224)
(AD-P003929) Avail: NTIS HC A22/MF A01 CSCL 06/4

This paper is concerned with some issues in cognitive psychology that are relevant to the general question of what artificial intelligence techniques can do toward the solution of problems concerning equipment training and maintenance. Three topics will be discussed. The first is the nature of expertise in electronics, which is not very well understood. The second topic is the relation between instructions and expertise. The third topic is technical documentation. GRA

N85-11610# Colorado Univ., Boulder. Inst. of Cognitive Science.
ARTIFICIAL INTELLIGENCE APPROACHES TO MONITORING SYSTEM INTEGRITY
R. A. Maxion *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 257-273 (For primary document see N85-11592 02-63)
(AD-P003930) Avail: NTIS HC A22/MF A01 CSCL 09/3

This paper introduces the concept of artificial intelligence-based (expert) systems for enhancing system availability through system integrity monitoring and system diagnosis. Such expert systems use knowledge and inference mechanisms to solve problems which would ordinarily require the expertise of the best human practitioners in the field. The paper demonstrates the seriousness of failure and explains why several traditional methods of ensuring system

availability, reliability, and maintainability fail in certain important cases, e.g., intermittent failures. An outline of the human diagnostic problem-solving process is presented with a computational analog. A symptom-based expert diagnostic system(*) is introduced with its early and successful results in fault prediction. Author (GRA)

N85-11611# Air Force Human Resources Lab., Brooks AFB, Tex.
AFHRL (AIR FORCE HUMAN RESOURCES LABORATORY) PROGRAM FOR ARTIFICIAL INTELLIGENCE APPLICATIONS TO MAINTENANCE AND TRAINING
B. Dallman *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 275-286 (For primary document see N85-11592 02-63)
(AD-P003931) Avail: NTIS HC A22/MF A01 CSCL 05/1

The young science of artificial intelligence has not yet produced a technology that can be used to solve real world problems in a consistent manner; however, within the next 10 years it is expected that practical application of some forms may be commonplace. The time is ripe for military laboratories to start stimulating and guiding research in the development of systems which would extend the capabilities of the military forces. AFHRL is initiating a program to participate in the development of AI technology as it applies to maintenance aiding and training. Measurable outcomes could include lower mean time to repair, a greater operational readiness, and a stabilized corporate experience base resistant to personnel attrition. Other benefits could include enhanced personnel productivity, greater training efficiency, and decreased task loading on weapon systems personnel. This program has three principal goals. First, the program will apply AI technology to real Air Force problems in the maintenance aiding and training domains through an integrated system. The second goal is to establish a capability for the conduct and examination of artificial intelligence research. The third goal will be to assist/consult with other Air Force organizations in the development and exploitation of the evolving AI technology. GRA

N85-11612# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DEPOT LEVEL PROBLEMS IN THE TESTING OF PRINTED CIRCUIT BOARDS
R. Milne *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 287-292 (For primary document see N85-11592 02-63)
(AD-P003932) Avail: NTIS HC A22/MF A01 CSCL 09/3

The Air Force today has a severe problem in the automatic testing of analog cards. Most automated test programs run a structured series of tests requiring many hours. Even after several hours of testing, the program has reduced the fault to as many as 10 potential components. In most cases, it is not possible to reorder the tests. As a result, there is no way to indicate to the system that the last test is the one which is most likely to identify the fault. At the Air Force Institute of Technology, we are working with Warner-Robins Air Logistics Center(WRALC) to develop an expert system for the diagnosis of faults in analog circuit cards. WRALC has a large depot of Automated Test Equipment which runs virtually 24 hours a day, 7 days a week. Their problems include inflexible programs which proceed in sequence even if it is believed the failure to be located would be found by one of the last tests to be run. Some of these programs take 3 1/2 hours to run. GRA

N85-11613# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
EXPERT SYSTEMS IN MAINTENANCE DIAGNOSTICS FOR SELF-REPAIR OF DIGITAL FLIGHT CONTROL SYSTEMS
J. Davison *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 293-304 (For primary document see N85-11592 02-63)
(AD-P003933) Avail: NTIS HC A22/MF A01 CSCL 14/2

This article covers three basic components of this program. One is an overview and the progress of the program starting off with the battle damage statistics that are supplied to us by aircraft battle damage repair people. These statistics are the drivers that influence the self-repairing program. These are gathered primarily from Southeast Asian data, updated from the Falklands conflict and Israeli data. Secondly, the article discusses briefly about the self-repairing concept, and thirdly, the status of our expert system for maintenance diagnostics. GRA

N85-11614# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
ARTIFICIAL INTELLIGENCE CONTRIBUTIONS TO TRAINING AND MAINTENANCE
J. Psotka *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 305-315 (For primary document see N85-11592 02-63)
(AD-P003934) Avail: NTIS HC A22/MF A01 CSCL 06/4

Artificial intelligence is rapidly becoming a practical and useful technology for training and maintenance. This paper provides an introduction to its uses in maintenance training, drawing on current research funded by the Army. After a description of this work, a call is made to fund more exploratory research, expand the base of competent professionals in the field, and begin the complicated process of evaluating this new technology in order to diagnose its failings and hasten its development. Author (GRA)

N85-11615# Naval Air Systems Command, Washington, D. C.
NAVAIR'S (NAVAL AIR SYSTEMS COMMAND) AI (ARTIFICIAL INTELLIGENCE) PROGRAM FOR ATE (AUTOMATED TEST EQUIPMENT)
R. Shumaker *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 317-330 (For primary document see N85-11592 02-63)
(AD-P003935) Avail: NTIS HC A22/MF A01 CSCL 06/4

This article discusses an artificial intelligence program for automated test equipment. GRA

N85-11616# Naval Air Engineering Center, Lakehurst, N.J.
ARTIFICIAL INTELLIGENCE APPLICATIONS TO AUTOMATIC TEST EQUIPMENT
J. L. Kunert *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 331-340 (For primary document see N85-11592 02-63)
(AD-P003936) Avail: NTIS HC A22/MF A01 CSCL 06/4

The Naval Air Engineering Center (NAEC) under the sponsorship of the Naval Air Systems Command has initiated a program to develop and demonstrate artificial intelligence (AI) applications to automatic test equipment for sharply improved Navy aircraft support operations. This paper will discuss the NAEC AI program and why such a program was initiated. GRA

N85-11617# Navy Center for Applied Research in Artificial Intelligence, Washington, D.C.
MODEL-BASED PROBABILISTIC REASONING FOR ELECTRONICS TROUBLESHOOTING
R. R. Cantone *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 341-352 (For primary document see N85-11592 02-63)
(AD-P003937) Avail: NTIS HC A22/MF A01 CSCL 05/9

The Navy A.I. Center is currently developing a series of increasingly sophisticated expert consultant systems for guiding a novice technician through each step of an electronics troubleshooting session. One of the goals is to automatically produce, given a set of initial symptoms, a binary (pass/fail) decision tree of testpoints to be checked by the technician. This paper discusses our initial approach using a modified game tree search technique, the gamma miniaverage method. One of the parameters which guides this search technique - the cost of each test - the conditional probability of test outcomes and the proximity to a solution are provided by a dynamic model of an expert troubleshooter's beliefs about what in the device is good and what is bad. This model of beliefs is updated using probabilistic test-results yields plausible-consequences rules. These rules are either provided by an expert technician, or approximately by a model-guided Rule Generator. The model that guides the generation of rules is simple block diagram of the Unit Under Test augmented with component failure rates. GRA

N85-11618# Navy Personnel Research and Development Center, San Diego, Calif.
IMPLICATIONS OF ARTIFICIAL INTELLIGENCE FOR A USER DEFINED TECHNICAL INFORMATION SYSTEM
R. J. Smillie *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 353-359 (For primary document see N85-11592 02-63)
(AD-P003938) Avail: NTIS HC A22/MF A01 CSCL 05/2

UDTISis an electronic, computer-based device related to Stanley Kubrick's 2001's HAL. Size is unknown, but UDTIS has contained within it or has access to all the technical and training information of the particular operational system for which UDTIS covers. UDTIS may have multiple screens to permit simultaneous viewing of different types of technical information. Display characteristics are unknown, but it does present the technical information in a form that the user readily understands. The degree of interactiveness is also unknown, but UDTIS is more than user friendly. UDTIS has to know the background and capabilities of the user and has to anticipate the needs of the user. GRA

N85-11619# General Dynamics Corp., San Diego, Calif. Electronics Div.
APPLICATION OF ARTIFICIAL INTELLIGENCE TO EQUIPMENT MAINTENANCE
J. H. Hinchman and M. C. Morgan *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 363-379 (For primary document see N85-11592 02-63)
(AD-P003939) Avail: NTIS HC A22/MF A01 CSCL 06/4

All military services are confronted with increased training costs, reduced training budgets and a widening gap between the skills of entry-level personnel and the abilities required to maintain increasingly sophisticated systems. Institutional training is being minimized, and more emphasis is placed on on-the-job training. This requires a greater reliance on built-in test equipment and organic automatic test equipment support. Unfortunately, automated testing (built-in or off-line) does not unambiguously fault-isolate all of the time. The result is a high rate (up to 30%) of removal and replacement of non-faulty assemblies. Reduction of the number of suspected faulty assemblies within an ambiguity group requires manual troubleshooting. The manual troubleshooting procedure used to fault isolate to a single assembly typically involves an exhaustive method of remove-replace-retest. This manual troubleshooting method is expensive in terms of both test time and logistics support. A computer-based intelligent Maintenance Aid offers a solution to this problem. Author (GRA)

N85-11620# Smart Systems Technology, Inc., McLean, Va.
KNOWLEDGE BASED TOOLS FOR ELECTRONIC EQUIPMENT MAINTENANCE
T. L. Williams *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 381-395 (For primary document see N85-11592 02-63)
(AD-P003940) Avail: NTIS HC A22/MF A01 CSCL 05/1

The sophisticated weapon systems on which our national defense depend pose considerable maintenance problems. Increased training costs, reduced training budgets, and a widening gap between the skills of entry-level personnel and the abilities required to maintain such weapon systems suggests the need for improved job performance aids and on-the-job training. Knowledge based tools for electronic equipment maintenance offer a novel approach to this problem. This paper presents our experience at Smart Systems Technology over the past eighteen months in building knowledge based maintenance aids for electronic equipment. The presentation begins with a discussion of ARBY in the context of the Network Diagnostic System, and concludes with an overview of the Knowledge Engineering Language. GRA

N85-11621# General Electric Co., Schenectady, N. Y.
DELTA: AN EXPERT SYSTEM FOR DIESEL ELECTRIC LOCOMOTIVE REPAIR
P. P. Bonissone and H. E. Johnson, Jr. *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 397-413 (For primary document see N85-11592 02-63)
(AD-P003941) Avail: NTIS HC A22/MF A01 CSCL 05/1

In recent years, expert systems have become the most visible and the fastest growing branch of Artificial Intelligence. General Electric Company's Corporate Research and Development has applied expert system technology to the problem of troubleshooting and the repair of diesel electric locomotives in railroad running repair shops. The expert system uses production rules and an inference engine that can diagnose multiple problems with the locomotive and can suggest repair procedures to maintenance personnel. A prototype system has been implemented in FORTH, running on a Digital Equipment PDP 11/23 under RSX-11M. This system contains approximately 530 rules (roughly 330 rules for the Troubleshooting System, and 200 rules for the Help System), partially representing the knowledge of a Senior Field Service Engineer. The inference engine uses a mixed-mode configuration, capable of running in either the forward or backward mode. The Help System can provide the operator with assistance by displaying textual information, CAD diagrams or repair sequences from a video disk. The rules are written in a representation language consisting of nine predicate functions, eight verbs, and five utility functions. The first field prototype expert system, designated was delivered in July 1983 and is currently under field evaluation.
Author (GRA)

N85-11622# General Electric Co., Schenectady, N. Y.
AN EFFECTIVE GRAPHICS USER INTERFACE FOR RULES AND INFERENCE MECHANISMS
J. W. Lewis *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 415-419 (For primary document see N85-11592 02-63)
(AD-P003942) Avail: NTIS HC A22/MF A01 CSCL 09/2

As the technology of rule-based inference mechanisms matures, knowledge, acquisition - the creation, structuring, and verification of rules - becomes increasingly important. The accuracy and completeness of the rules in the knowledge base determine expert system performance, and the cost of acquiring that knowledge base dominates all other hardware and software costs in practical systems. To reduce knowledge acquisition time and error rate, a new interactive graphics interface for rules is being designed and implemented in GE Corporate Research and Development. In the new system, each set of rules is represented as an AND/OR graph and parts of the rule base are displayed on a CRT screen as an AND/OR tree. A user - even an unsophisticated user - can navigate the AND/OR graph, identify nodes to be modified, analyze the behavior of the graph, verify its correctness graphically, and follow the execution of inference engines.
Author (GRA)

N85-11623# Bell Telephone Labs., Inc., Whippany, N. J.
THE ACE (AUTOMATED CABLE EXPERT) EXPERIMENT: INITIAL EVALUATION OF AN EXPERT SYSTEM FOR PREVENTIVE MAINTENANCE
F. D. Miller, D. H. Copp, G. T. Vesonder, and J. E. Zielinski *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 421-428 (For primary document see N85-11592 02-63)
(AD-P003943) Avail: NTIS HC A22/MF A01 CSCL 05/1

ACE (Automated Cable Expert) is a knowledge-based system designed to direct preventive maintenance activities in the local telephone network. ACE was developed at AT&T Bell Laboratories to demonstrate and evaluate the potential for using expert systems technology in cable maintenance. This paper describes the role of ACE in the maintenance process and discusses the methods used to evaluate ACE's performance in the field. Some general issues for the evaluation of expert systems also will be considered. Author (GRA)

N85-11624# Lockheed Missiles and Space Co., Palo Alto, Calif.
LES: (LOCKHEED EXPERT SYSTEM): A MODEL-BASED EXPERT SYSTEM FOR ELECTRONIC MAINTENANCE
T. J. Laffey, W. A. Perkins, and O. Firschein *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 429-450 (For primary document see N85-11592 02-63)
(AD-P003944) Avail: NTIS HC A22/MF A01 CSCL 14/2

Existing Automatic Test Equipment is often inadequate for quickly isolating component failure in large electronic systems. The Lockheed Expert System (LES) has been designed to guide less-experienced maintenance personnel in the fault diagnosis of electronic systems. LES uses not only the knowledge of the expert diagnostician (captured in the familiar form of IF-THEN rules), but also knowledge about the structure, function, and causal relations of the device under study to perform rapid isolation of the module causing the failure. In addition to aiding the engineer in trouble-shooting an electronic device, LES can also explain its reasoning and actions to the user, and can provide extensive database retrieval and graphics capabilities. This discusses the application of LES to a large signal-switching network containing Built-In Test Equipment (BITE). By adding rules, database information, and a few special procedures to the general LES framework, we were able to have a working system in a much shorter time (four man-months) than would have been possible starting afresh. GRA

N85-11625# Boeing Aerospace Co., Seattle, Wash.
THE APPLICATION OF ARTIFICIAL INTELLIGENCE TO A MAINTENANCE AND DIAGNOSTIC INFORMATION SYSTEM
D. R. Antonelli *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 451-480 (For primary document see N85-11592 02-63)
(AD-P003945) Avail: NTIS HC A22/MF A01 CSCL 05/1

Increasing problems in the complexity of military systems, fault diagnostics, and maintenance training are affecting the readiness of the military services. Expert Systems, a discipline of Artificial Intelligence, appears to offer solutions to many of these problems. However, some problems do exist in present Expert Systems. This paper addresses a different approach to the applications of Expert Systems to logistics in the development of a Maintenance and Diagnostics Information System (MDIS). The MDIS is a multi-domain knowledge acquisition system that supports integrated diagnostics, maintenance, training, data collection and data analysis. Use of systems like these provide each recruit with a computerized expert to aid in the diagnosis and maintenance of system faults. GRA

N85-11626# Hughes Aircraft Co., Long Beach, Calif. Support Systems.
INTELLIGENT INFORMATION RETRIEVAL FROM ON-LINE TECHNICAL DOCUMENTATION
A. F. Griffin *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 481-491 (For primary document see N85-11592 02-63)
(AD-P003946) Avail: NTIS HC A22/MF A01 CSCL 09/2

Computerized maintenance manuals contained in massive, on-line text and graphics data bases require an intelligent facility for information retrieval. An unsophisticated user must be able to easily find specific facts, procedures, etc. without having to specify precisely the information he seeks. Hughes is developing an intelligent retrieval approach based on semantic network knowledge representation. Because conventional serial computers are too slow for large semantic networks, we have designed and prototyped special purpose, parallel processing hardware called Associative Loop Memory (ALOOP). ALOOP also dynamically organizes a knowledge base in a manner that imitates human memory.
Author (GRA)

N85-11627# Martin Marietta Aerospace, Denver, Colo.
ON THE REQUIREMENTS OF EXPERT SYSTEMS FOR FAULT ISOLATION
J. VanBaalen *In* Denver Research Inst. Artificial Intelligence in Maintenance Jun. 1984 p 493-504 (For primary document see N85-11592 02-63)
(AD-P003947) Avail: NTIS HC A22/MF A01 CSCL 05/1

Martin Marietta Denver Aerospace is involved in applications oriented research and development in artificial intelligence. The charter of the group is to augment Martin Marietta's existing technology based with artificial intelligence (AI). Our research and applications work is integrated in the sense that they drive each other in an iterative fashion. That is, DOD and NASA applications have led us to pursue research into our AI software tool set. This enhanced tool set has, in turn, made new applications of AI possible. Three areas of AI form our main research and development thrusts: expert systems, natural language understanding, and planning. Our experience has shown that applications require a mixture of techniques from these different areas. For example, it is often appropriate to utilize a natural language front end in expert systems applications. Also, for some planning problems, we are employing an expert system approach. GRA

N85-11628# Yale Univ., New Haven, Conn. Dept. of Computer Science.
MEMORY-BASED EXPERT SYSTEMS Interim Report, 15 Jan. 1983 - 14 Jan. 1984
R. C. Schank Aug. 1984 11 p
(Contract F49620-82-K-0010)
(AD-A145612; AFOSR-84-0814TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

During this period the investigators produced four papers with titles including, knowledge reorganization and reasoning style, Assignment of responsibility in ethical judgments, Generating hypotheses to explain prediction failures, and Learning, explanation, and a little history. They are developing a model of expertise that more closely resembles the way in which humans become experts, namely, through experience. They assume that the rule-base is not the primary repository of knowledge, but rather rules are derived from experience. Their model addresses the three problems given above as follows. (1) The knowledge-base is derived primarily from the enumeration of specific cases or experiences. They have found that a human expert is much more capable of recalling experiences than articulating internal rules. They suggest that the reason for this difference is that the human expert may not in fact be using rules in the first place. (2) As problems are presented to the system for which no specific case or rule can match exactly, the system can reason from more general similarities to compute up with an answer. This second level of reasoning should more closely resemble human problem solving behavior when people are confronted with novel situations. (3) A cornerstone to this method is automatic learning. The system's memory of experiences will be changed and augmented by each additional case that is presented. The system will remember the problems that it has encountered and use that information to solve future problems. These three principles of the memory-based expert systems model are being tested in several related projects. GRA

N85-11629# Naval Weapons Center, China Lake, Calif.
ASYMPTOTICALLY OPTIMAL ADAPTIVE CONTROL Final Report
W. W. Willman Jul. 1984 65 p
(AD-A145666; NWC-TP-6530) Avail: NTIS HC A04/MF A01 CSCL 12/1

By means of augmenting the state vector, a stochastic optimal control problem, which is of the standard multivariate linear-quadratic-Gaussian type except for a relatively small degree of uncertainty in some of its parameters, is reformulated as a nonlinear stochastic optimal control problem with known parameters, certain of which are small. A perturbation analysis is used to derive an approximation of the optimal control law which is formally accurate to second order in these small parameters. Author (GRA)

N85-11630# Sheffield Univ. (England). Dept of Control Engineering.
ON A CLASS OF SUBOPTIMAL CONTROLS FOR INFINITE-DIMENSIONAL BILINEAR SYSTEMS
S. P. Banks and M. K. Yew 1984 12 p refs
(RR-258) Avail: NTIS HC A02/MF A01

Suboptimal controls for a bilinear system subject to a quadratic cost criterion are derived. The feedback control is in the space of formal power series on a Hilbert space, and can be calculated recursively. Bounded operators only are considered. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-11631# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
APPROXIMATION OF DISCONTINUOUS SOLUTIONS OF HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis - Pretoria Univ., Oct. 1982
Barbara Kok Mar. 1983 127 p refs
(NRIMS-TWISK-302) Avail: NTIS HC A07/MF A01

The approximation of the solution of a model hyperbolic partial differential equation, namely Delta u/delta t + delta u/delta x, is considered. The Cauchy problem on the real line is addressed. A dissipative Galerkin method based on Hermite cubics is discussed. R.S.F.

N85-11632# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A FAST, COMPACT ASSIGNMENT ALGORITHM
D. P. Laurie Sep. 1983 24 p refs
(NRIMS-TWISK-331) Avail: NTIS HC A02/MF A01

The m x n assignment problem is solved by a modified Hungarian algorithm in which the data matrix is built up column by column. Many of the usual bookkeeping operations are thereby avoided, leading to a compact FORTRAN code that requires only four vectors of extra storage. An alternative version uses row and column bordering. Numerical experiments in which the two versions are compared to three other published algorithms show that the first version is fastest for data matrices with uncorrelated entries while the second is fastest for problems with high correlation between elements in the data matrix. Author

N85-11633# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NUMERICAL METHODS FOR SOLVING SYSTEMS OF LINEAR EQUATIONS [METODOS NUMERICOS PARA A RESOLUCAO DE SISTEMAS DE EQUACOES LINEARES]
Hans-Ulrich Pilchowski Aug. 1984 28 p refs In PORTUGUESE; ENGLISH summary
(INPE-3240-RPE/463) Avail: NTIS HC A03/MF A01

The aim of the routines described, is to solve systems of linear equations. The methods used here are of Gauss elimination, Gauss-Jordan, Gauss-Seidel and conjugated gradient. Author

N85-11634*# Exxon Research and Engineering Co., Linden, N.J.
THE NUMERICAL SOLUTION OF THE HELMHOLTZ EQUATION FOR WAVE PROPAGATION PROBLEMS IN UNDERWATER ACOUSTICS Final Report
Alvin Bayliss, Charles I. Goldstein (BNL), and Eli Turkel (Tel Aviv Univ.) Sep. 1984 31 p refs
(Contracts NAS1-17130; DE-AC02-76CH-00016)
(NASA-CR-172454; NAS 1.26:172454; ICASE-84-49) Avail: NTIS HC A03/MF A01 CSCL 12A

The Helmholtz Equation (-delta-K(2)n(2))u=0 with a variable index of refraction, n, and a suitable radiation condition at infinity serves as a model for a wide variety of wave propagation problems. A numerical algorithm was developed and a computer code implemented that can effectively solve this equation in the intermediate frequency range. The equation is discretized using the finite element method, thus allowing for the modeling of complicated geometrices (including interfaces) and complicated boundary conditions. A global radiation boundary condition is imposed at the far field boundary that is exact for an arbitrary number of propagating modes. The resulting large, non-selfadjoint system of linear equations with indefinite symmetric part is solved using the preconditioned conjugate gradient method applied to the normal equations. A new preconditioner is developed based on the multigrid method. This preconditioner is vectorizable and is extremely effective over a wide range of frequencies provided the number of grid levels is reduced for large frequencies. A heuristic argument is given that indicates the superior convergence properties of this preconditioner. M.G.

N85-11635*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BOUNDARY CONDITIONS IN CHEBYSHEV AND LEGENDRE METHODS Final Report
Claudio Canuto (Consiglio Nazionale della Ricerche) Oct. 1984 40 p refs
(Contract NAS1-17070)
(NASA-CR-172469; NAS 1.26:172469; ICASE-84-52) Avail: NTIS HC A03/MF A01 CSCL 12A

Two different ways of treating non-Dirichlet boundary conditions in Chebyshev and Legendre collocation methods are discussed for second order differential problems. An error analysis is provided. The effect of preconditioning the corresponding spectral operators by finite difference matrices is also investigated. B.W.

N85-11636# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.
ABOUT AMBIGUITY AND Q-FUNCTIONS
E. R. McKee Dec. 1983 15 p
(AD-A145293; AD-E950543; DRSMI/RE-84-7-TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the Ballistic Missile Defense (BMD) community, considerable emphasis is placed upon the utilization of ambiguity and, to a greater extent, Q-functions. Quite often these functions are incorrectly applied and almost always mislabeled. The purpose of this report is to present a short tutorial on the origin and application of these functions. Author (GRA)

N85-11637# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A FINITE ELEMENT PROJECTION METHOD FOR THE SOLUTION OF PARTICLE TRANSPORT PROBLEMS WITH ANISOTROPIC SCATTERING Ph.D. Thesis
E. E. Wills Jul. 1984 236 p
(AD-A145382; AFIT/CI/NR-84-56D) Avail: NTIS HC A11/MF A01 CSCL 12/1

A solution method for solving particle transport problems has been developed. This solution approach embodies a finite element projection technique and a related equivalent variational Raleigh-Ritz formalism. Particle flux in the transport equation is expressed as a linear and separable sum of odd and even components in the direction variables. Then a classical variational principle is obtained and shown to be equivalent to a Bubnov-Galerkin projected solution. A dual finite element basis of polynomial splines in space and spherical harmonics in angle is used in the Bubnov-Galerkin equations. The general theoretical and numerical problem formalism is carried out in a 3-dimensional geometry with anisotropic scattering and with a piecewise constant energy dependence. This is a seven-dimensional problem with time dependence, three spatial and two angular or directional variables and with a multigroup treatment of the energy dependence. The boundary conditions for most physical problems of interest are dealt with explicitly and rigorously by a classical minimization (variational) principle. The computational validation of the method was obtained by a computer solution to the air-over-ground problem. This problem is of significant interest in the areas of nuclear weapons effects and radiation physics. GRA

N85-11638# University of Southern California, Los Angeles. Dept. of Mathematics.
INVERSE PROBLEMS, OPTIMIZATION AND ALGORITHMS Final Scientific Report, 1 Jul. 1980 - 30 Jun. 1983
J. Milstein 9 Jul. 1984 9 p
(Grant AF-AFOSR-0243-80)
(AD-A145397; AFOSR-84-0743TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research completed includes the following: The dynamics of a system of nonlinear ordinary differential equations depends on the constant coefficients (parameters) of the system. Identifying these coefficients from the solution curves defines an inverse problem. A method to determine the values of the parameters

from a finite number of solution curves was developed and implemented. The method consists of two major algorithmic procedures (1) A derivative free nonlinear optimization, and (2) an error analysis of the parameters found. GRA

N85-11639# Iowa Univ., Iowa City. Dept. of Statistics and Actuarial Science.
AN ITERATIVE PROCEDURE FOR OBTAINING I-PROJECTIONS ONTO THE INTERSECTION OF CONVEX SETS
R. L. Dykstra Jun. 1984 23 p
(Contract N00014-83-K-0249)
(AD-A145402; TR-106) Avail: NTIS HC A02/MF A01 CSCL 12/1

A frequently occuring problem is to find that probability distribution (PD) lying within a convex set which minimizes the I-divergence between it and given PD R. This document proposes an iterative procedure which requires only that the set be convex (and not necessarily linear) which under general conditions will converge to the desired I-projection. GRA

N85-11640# Iowa Univ., Iowa City. Dept. of Statistics and Actural Science.
AN ALGORITHM FOR LEAST SQUARES PROJECTIONS ONTO THE INTERSECTION OF SHIFTED, CONVEX CONES Technical Report
R. L. Dykstra Jan. 1984 15 p
(Contract N00014-83-K-0249)
(AD-A145428; TR-103) Avail: NTIS HC A02/MF A01 CSCL 12/1

A commonly occurring problem is that of minimizing least squares expressions subject to restrictions on the solution. Dykstra has given a simple algorithm for solving these types of problems when the constraint region can be expressed as a finite intersection of closed, convex cones. Here it is shown that this algorithm must still work correctly even when each cone is allowed to be arbitrarily translated (as long as the intersection is non-empty). This allows the algorithm to be applied to a much larger collection of problems than previously indicated. Author (GRA)

N85-11641# Iowa Univ., Iowa City.
CONSTRAINED OPTIMIZATION USING ITERATED PARTIAL KUHN-TUCKER VECTORS
R. L. Dykstra and P. C. Wollan May 1984 17 p
(Contract N00014-83-K-0249)
(AD-A145476; TR-105) Avail: NTIS HC A02/MF A01 CSCL 12/1

A frequently occurring problem is that of minimizing a convex function subject to a finite set of inequality constraints. Often what makes this problem difficult is the sheer number of constraints. That is, we could solve this problem for a smaller set of constraints, but solving for the total set causes difficulty. Here the authors discuss an approach which uses our ability to solve these partial problems to lead to a total solution. They illustrate the method with several examples in the last section of the paper. This approach will be somewhat heuristic in nature to promote understanding. GRA

N85-11642# North Carolina Univ., Chapel Hill. Center for Stochastic Precesses.
LIMIT THEORY FOR THE SAMPLE COVARIANCE AND CORRELATION FUNCTIONS OF MOVING AVERAGES
R. Davis and S. Resnick Jul. 1984 36 p
(Contract F49620-82-C-0009; Grant NSF DMS-82-02335)
(AD-A145488; TR-68; AFOSR-84-0745TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Document describes a moving average process which have regularly varying tail probabilities with index alpha > 0. The limit distribution of the sample covariance function is derived in the case that the process has a finite variance but an infinite variance but an infinite fourth moment. Furthermore, in the infinite variance case ($0 <$ alpha < 2), the sample correlation function is shown to converge in distribution to the ratio of two independent stable random variables with indices alpha and alpha/2, respectively. This result immediately gives the limit distribution for the least squares estimates of the parameters in an autoregressive process. Author (GRA)

N85-11643# Washington State Univ., Pullman. Dept. of Pure and Applied Mathematics.
RAPIDLY CONVERGENT ALGORITHMS FOR NONSMOOTH OPTIMIZATION Interim Scientific Report, 15 Jul. 1983 - 14 Jul. 1984
R. Mifflin 14 Jul. 1984 5 p
(Grant AF-AFOSR-0210-83)
(AD-A145556; AFOSR-84-0727TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research has led to new developments for solving nonlinear optimization problems involving functions that are not everywhere differentiable and/or are implicity defined. For the single variable case a method has been given which combined polyhedral and quadratic approximation, and automatic scale-free penalty technique and a safeguard that insures convergence to a stationary point, but does not detract from rapid convergence. Under relatively weak convergence rate assumptions the algorithm exhibits a new type of better than linear convergence. The safequard also has the practical advantage of keeping apart points that are used in denominators of difference quotients for approximating second derivatives. A practical single resource allocation problem with several bounded decision variables has been solved very efficiently via a dual technique that used the single variable method in a nested manner to solve both the outer dual problem and the inner Lagrangian subproblems. The new concept of better than linear convergence form the single variable case has been generalized to the multivariable case. Author supplied key words also include; constrained minimization, and line search. GRA

N85-11644# South Carolina Univ., Columbia. Dept. of Mathematics and Statistics.
NONPARAMETRIC MAXIMUM PENALIZED LIKELIHOOD ESTIMATION OF A DENSITY FROM ARBITRARILY RIGHT-CENSORED OBSERVATIONS
A. M. Lubecke and W. J. Padgett Jun. 1984 19 p
(Grant AF-AFOSR-0156-84)
(AD-A145569; TR-96; Rept-62G05-9; AFOSR-84-0668TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Based on arbitrarily right-censored observations from a probability density function f deg, the existence and uniqueness of the maximum penalized likelihood estimator (MPLE) of f deg is proven. In particular, the first MPLE of Good and Gaskins of a density defined on (0, infinity) is shown to exist and to be unique under arbitrary right-censorship. Furthermore, the MPLE is in the form of an exponential spline which knots at the observed censored and uncensored data points. Author (GRA)

N85-11645# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN INVESTIGATION INTO FUZZY CLUSTERING AND CLASSIFICATION M.S. Thesis
M. R. Gray Jul. 1984 114 p
(AD-A145571; AFIT/CI/NR-84-47T) Avail: NTIS HC A06/MF A01 CSCL 12/1

Pattern recognition algorithms based on fuzzy set theory were investigated and compared to their analogs which use traditional, or crisp set theory. The fuzzy K-means clustering algorithm was investigated and the fuzzy K-nearest neighbor and fuzzy 1-nearest prototype classifier algorithms were developed. These pattern recognition algorithms produce membership assignments (values from zero to one) for the samples considered. Thus, a sample's degree of belonging in a class can be assessed via these membership assignments. GRA

N85-11646# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
ON SOME COMMON INTERESTS AMONG RELIABILITY, INVENTORY AND QUEUING
D. Gross 13 Jun. 1984 18 p
(Contract N00014-83-K-0217; Grant NSF ECS-82-00837)

(AD-A145595; GWU/IMSE/SERIAL-T-491/84) Avail: NTIS HC A02/MF A01 CSCL 12/2

Queuing networks can be used to model maintained systems. Under many conditions, closed queuing network theory can be applied to ascertain the availability of such systems. Multi-echelon repairable item inventory systems serve as one such class of examples. Problems of common interest to the reliability, queuing, and inventory communities are highlighted, and solution techniques for these problems presented. Author (GRA)

N85-11647# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ALGEBRAIC FUNCTIONS OF H-FUNCTIONS WITH SPECIFIC DEPENDENCY STRUCTURE Ph.D. Thesis - Texas Iniv., Austin
S. D. Kellogg May 1984 226 p
(AD-A145598; AFIT/CI/NR-84-39D) Avail: NTIS HC A11/MF A01 CSCL 12/1

A practical technique is presented for determining the probability density function and cumulative distribution function of products, quotients, and powers of dependent random variables with bivariate H-function distributions. The bivariate H-function is the most general function of two variables, encompassing as special cases most of the other special functions of mathematics and many of the classifical bivariate distributions. The unique properties of the bivariate H-function make it a powerful tool in the analysis of products, quotients, and powers of dependent random variables. GRA

N85-11648# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
WEIGHTED DISTRIBUTIONS ARISING OUT OF METHODS OF ASCERTAINMENT
C. R. Rao Jul. 1984 45 p
(Contract F49620-82-K-0001)
(AD-A145615; TR-84-38; AFOSR-84-0829TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The concept of weighted distributions can be traced to the study of the effects of methods of ascertainment upon the estimation of frequencies by Fisher in 1934, and it was formulated in general terms by the author in a paper presented at the first International Symposium on Classical and Contagious Distributions held in Montreal in 1963. Since then, a number of papers have appeared on the subject. This paper reviews some previous work, points out, through appropriate examples, some situations where weighted distributions arise and discusses the associated methods of statistical analysis. The importance of specification of the class of underlying probability distributions (or stochastic model) in data analysis based on a detailed knowledge of how data are obtained is emphasized. Failure to take into account the conditions of ascertainment of data can lead to wrong conclusions. GRA

N85-11649# Brown Univ., Providence, R. I. Center for Dynamical Systems.
CONTROL AND IDENTIFICATION OF TIME VARYING SYSTEMS Interim Report, 30 Jun. 1983 - 29 Jun. 1984
A. E. Pearson Aug. 1984 8 p
(Grant AF-AFOSR-0230-82)
(AD-A145638; AFOSR-84-0842TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Current research is summarized for the parameter identification of a class of polynomial differential systems via the modulating function method. The underlying computations involve calculating a finite number of Fourier coefficients of the input-output data which can be determined using a fast Fourier transform algorithm. Current research is also described for devising stabilizing feedback control laws for a class of differential-delay systems using a spectral factorization of the state space. GRA

N85-11650# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
NUMERICAL METHODS FOR SINGULARLY PERTURBED DIFFERENTIAL EQUATIONS WITH APPLICATIONS Interim Report, 1 Jun. 1983 - 31 May 1984
J. E. Flaherty Aug. 1984 21 p
(Grant AF-AFOSR-0192-80)
(AD-A145639; AFOSR-84-0844TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this period research was continued on the development and application of numerical methods for singularly-perturbed (or stiff) boundary value problems for ordinary differential equations and initial-boundary value problems for partial differential equations. The author concentrated most heavily on extensions to the adaptive finite element methods for partial differential equations. In particular, the stability of several mesh moving schemes was analyzed and local refinement techniques developed. The author also has some encouraging preliminary results on mesh moving methods in two dimensions. The investigators are applying their methods to several interesting physical problems, such as elastic-plastic solids, combustion, and a nonlinear Schroedinger equation which exhibits self focusing. Author (GRA)

N85-11651# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
LIKELIHOOD ESTIMATION FOR GENERALIZED MIXED EXPONENTIAL DISTRIBUTIONS
C. M. Harris and E. A. Sykes Jul. 1984 30 p
(Contract N00014-83-K-0624)
(AD-A145675; UVA/525393/SE85/104) Avail: NTIS HC A03/MF A01 CSCL 12/1

The class of probability functions expressed as linear (not necessarily convex) combinations of negative exponential densities is dense in the set of all distribution functions on the nonnegative reals. Because of this and resultant mathematical properties, such forms would appear to have excellent potential for wide application in stochastic modeling. This work documents the development and testing of a practical procedure for maximum-likelihood estimation for these generalized exponential mixtures. The algorithm offered for the problem is of the Jacobi type and guarantees that the result will provide a legitimate probability function of the prescribed type. Extensive testing has been performed and results are very favorable: convergence is rapid and the use of computer resources rather limited. Author (GRA)

N85-11652# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
SCATTERING BY A PARABOLIC CYLINDER: A UNIFORM ASYMPTOTIC EXPANSION
R. H. Ott 1 Aug. 1984 39 p
(Contract F04701-83-C-0084)
(AD-A145688; TR-0084(4925-06)-4; SD-TR-84-31) Avail: NTIS HC A03/MF A01 CSCL 12/1

A uniform asymptotic expansion in the variable, determining the location of the observer for the fields scattered by a perfectly conducting parabolic cylinder, is derived. This expansion can be applied to scattering by arbitrary smooth convex surfaces of variable curvature. The accuracy of numerical results is examined. Author (GRA)

N85-11653# Georgia Inst. of Tech., Atlanta.
DESIGN OF EDGE DETECTORS FOR REDUCED IMAGES Final Technical Report, 1 Jun. 1983 - 31 May 1984
D. J. Healy Jul. 1984 43 p
(Grant AF-AFOSR-0152-83)
(AD-A145700; AFOSR-84-0815TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The development of algorithms to extract informational features from imagery is an area of active research. These algorithms enable computerized devices to automatically locate and identify objects in the field of view of a sensor. An important Air Force application is automatic target identification and weapon guidance. Edges in an image contain much of the information necessary to classify objects. This investigation has centered on finding methods for reducing an image so as to maximize the retention of edge information which was subsequently extracted. The Hotelling transform which reduces image data so as to minimize intensity

mean-square error (IMSE) in the reconstructed image was also found to have significantly better edge retaining ability than simple averaging. The reconstructed edges were quantitatively compared to those in the original images using MSE and receiver operating characteristic based measures. One such measure used was the gradient mean-square error (GMSE). Both the reconstructed IMSE and GMSE using the Hotelling transform tend to decrease as the encoding block size increases. An equation relating GMSE to IMSE was developed. For image gradient blocks that are independently reconstructed, the linear transformation matrix A that minimizes the reconstructed GMSE and in that sense maximizes edge retention was derived. Author (GRA)

N85-11654# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
INPUT-OUTPUT STABILITY ANALYSIS WITH MAGNETIC HYSTERESIS NON-LINEARITY: A CLASS OF MULTIPLIERS
M. G. Safonov and K. Karimlou 8 Jun. 1984 6 p Presented at Am. Control Conf., San Diego, Calif., 6-8 Jun. 1984
(Grants NSF INT-83-02754; AF-AFOSR-0013-80)
(AD-A145729; AFOSR-84-0803TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A class of positive real multipliers is obtained to establish frequency domain conditions for stability of feedback systems containing ferromagnetic hysteresis non-linearity. Author (GRA)

N85-11655# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering.
UNITED STATES AIR FORCE ON RESEARCH ON ALGEBRAIC MANIPULATION Final Report, 1 Jul. 1983 - 30 Jun. 1984
J. Moses Aug. 1984 13 p
(Grant AF-AFOSR-0250-80)
(AD-A145737; AFOSR-84-0785TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this period the single investigator refined his technique for symbolic integration, implemented it in a computer program in MACSYMA, and produced and presented a paper describing his achievement entitled, An experiment toward a general quadrature for second order linear ordinary differential equations by symbolic computation. A measure of his success is that he was able to integrate successfully 90% of the 542 equations in Kamke's famous table. (Since 50 of these equations involved arbitrary functions, etc., for which the programs was not designed, the success rate is more appropriately 96%.) GRA

N85-11656# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
POINTWISE ITERATIONS OF FINITE ELEMENT MODELING OF ADVECTION-DIFFUSION EQUATIONS
G. T. Yeh Jul. 1984 25 p refs Presented at the Summer Computer Simulation Conf., Boston, 23 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE84-015284; CONF-840762-2) Avail: NTIS HC A02/MF A01

Pointwise iteration techniques including successive under-relaxation (SUR), Gauss-Seidel (G-S), and successive over-relaxation (SOR) schemes, are applied to advection-diffusion equations to derive the matrix equation with finite element methods. Numerical experiments indicate that the iteration schemes, if convergent, produce almost identical solutions as those obtained by the direct elimination scheme. For diffusion dominant transport, all three iteration schemes generate convergent computations. However, for advection-diffusion equally dominant or advection dominant transport, only SUR and G-S schemes yield convergent calculations, the SOR scheme leads to divergent computations. Pointwise iteration schemes offer substantial savings in central process unit (CPU) memory over the direct elimination scheme, even for the small, two-dimensional verification example, without complicating the programming efforts and, in the meantime, keeps the CPU time comparable. A realistic, hypothetical problem is used to demonstrate the applicability and versatility of pointwise iterations and direct elimination schemes. DOE

N85-11657# California Univ., Livermore. Lawrence Livermore Lab.
COMPARISON OF THE MULTIGRID AND ICCG METHODS IN SOLVING THE DIFFUSION EQUATION M.S. Thesis
Mary Helen Voytko Jun. 1984 75 p refs
(Contract W-7405-eng-48)
(DE84-014409; UCRL-53553) Avail: NTIS HC A05/MF A01

The performance of the multigrid method and the Incomplete Cholesky conjugate Gradient (ICCG) method are compared in this paper. These methods are used in the context of solving the diffusion equation numerically. Both methods are described and test cases and computational results presented. The method of lines is used to solve the diffusion equation. Central difference formulas are used to approximate the spatial derivatives. The backward Euler difference operator is used to approximate the time derivatives. The multigrid and ICOG methods are used to solve the implicit equations. The multigrid method used a series of grids on the region over which the diffusion equation is to be solved. Each of the grids contains a subset of the points of the previous grid. The finest grid contains all of the points involved in the spatial differencing. A coefficient matrix containing the coupling coefficients is generated for each grid. On the coarsest grid, the resulting system may be solved directly. The solution is used to interpolate solutions at points on the finer grids. Relaxation sweeps are performed to accelerate the convergence at interpolated points. The etails of the multigrid algorithm and the special difficulties the diffusion equation poses are presented. The ICOG method is a variation of the generalized conjugate gradient method. DOE

N85-11658# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
DYNAMICS OF SYMMETRY BREAKING: PHASE COHERENCE IN FINITE AND RANDOM SYSTEMS
F. dePasquale 23 Nov. 1983 22 p refs
(Nota-Interna-813) Avail: NTIS HC A02/MF A01

Size, dimensionality and random field effects on the nonlinear dynamics of the purely relaxational time dependent Ginzgurg-Landau model are studied in the spherical limit. Results show that even when a symmetry broken phase is not allowed the system can exhibit a very slow approach to equilibrium analogous to the phase coherence phenomenon of laser instability. Author (ESA)

N85-11659# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
DISCRETIZATION FORMULAS ON AN ARBITRARY GRID
D. A. Humphreys Jul. 1984 17 p refs
(Contract FMV-F-FL-AU-1379-1)
(FFA-Memo-127) Avail: NTIS HC A02/MF A01

A procedure for solving differential equations numerically by substituting finite difference formulas for derivatives, with variable steps, is proposed. Explicit error estimates are given. Accuracy is limited by the highest derivative present, but a remedy is shown. Three-point formulas are treated and compared with other common methods. Author (ESA)

N85-11660# Sheffield Univ. (England). Dept. of Control Engineering.
THE NUMERICAL RANGE: A TOOL FOR ROBUST STABILITY STUDIES
D. H. Owens Jun. 1984 15 p refs
(RR-255) Avail: NTIS HC A02/MF A01

A method of approaching robust stability theory using the numerical range as a basis for error characterization and stability studies is described. The numerical range is seen to be a less conservative description of modelling error variation in terms of gain and permits a more detailed representation of gain and phase structure compared with singular value methodologies. In applying the stability theorem, the approach can deal with arbitrary large modelling errors where the phase is not destabilizing. It can be significantly less conservative than singular value methods but, in worst cases, it can be more conservative. The results are best used with singular value methods by, for example, application of

different methods over different frequency ranges covering the Nyquist contour. The method can possibly be extended to cover nonlinear perturbations. Author (ESA)

N85-11661# Sheffield Univ. (England). Dept. of Control Engineering.
LINEAR AND BILINEAR INFINITE-DIMENSIONAL REPRESENTATIONS OF FINITE-DIMENSIONAL NONLINEAR SYSTEMS
S. P. Banks and A. Ashtiani 1984 21 p refs
(RR-259) Avail: NTIS HC A02/MF A01

The representation of nonlinear systems by linear infinite dimensional systems is discussed, and a simple tensor operator representation for polynomial systems is obtained. For finite dimensional systems with finite escape times the infinite dimensional representation defines a bounded semigroup of operators on an appropriate Hilbert space until the escape time, when the semigroup becomes unbounded. The representation theory is applied to show that any nonlinear control system can be replaced by an equivalent infinite dimensional bilinear system. Results on suboptimal control are applied to the resulting system. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-11662# Iowa Univ., Iowa City. Dept. of Statistics and Acturial Science.
MAXIMUM LIKELIHOOD ESTIMATION OF THE SURVIVAL FUNCTIONS OF N STOCHASTICALLY ORDERED RANDOM VARIABLES
Carol J. Feltz (Western Electric Co., Inc., Princeton, N.J.) and Richard L. Dykstra Mar. 1984 31 p
(Contract N00014-83-K-0249)
(AD-A145429; TR-104) Avail: NTIS HC A03/MF A01 CSCL 12/1

Very often, populations exist that, logically, should satisfy linear stochastic ordering requirements. For example if a mechanical device is improved through N stages, the corresponding survival functions should be linearly stochastically ordered. Nevertheless, estimates may not reflect this stochastic ordering because of the inherent variability of the observations. This document characterizes the maximum likelihood estimates of the survival functions subject to linear stochastic ordering requirements. These estimates may be expressed in terms of the well-known Kaplan-Meier product limit estimates. Also given is an iterative algorithm which must converge to the correct solution that depends only upon solving the pairwise problem. Finally the authors consider an example concerning survival times for people with squamous carcinoma in the oropharynx when classified by degree of lymph node deterioration at time of discovery. Author (GRA)

N85-11663# Naval Air Development Center, Warminster, Pa. Sensors and Avionics Technology Directorate.
AUTO-REGRESSIVE MOVING AVERAGE SPECTRAL ESTIMATION USING MODIFIED AND LEAST SQUARES MODIFIED YULE-WALKER ESTIMATES Final Report
C. D. Pizzichello 2 Feb. 1984 78 p
(AD-A145516; NADC-84027-30) Avail: NTIS HC A05/MF A01 CSCL 12/1

Many popular contemporary spectral estimation methods invoke the modeling of the observation time series by a rational transfer function. These techniques employ the approximation of the second-order statistical relationships using the commonly known Yule-Walker equations. Solving these equations, one obtains the parameter estimates of the hypothesized rational transfer function model. These parameter estimates represent a set of autocorrelation time lags of the observation times series and are ideally selected to optimize the model being considered. Because of the optimization criteria, there are numerous methods/techniques which estimate parameters that have been proposed in the literature. The objective of this paper is to investigate two of these methods and report their respective performance. The most general rational transfer function containing both poles and zeros. Of the numerous techniques available in estimating the ARMA parameters, there are two which utilize the Modified Yule-Walker equations. This paper investigates both the Modified Yule-Walker (MYW) and Least Squares Modified Yule-Walter (LSMYW) methods in estimating an ARMA process. The MYW method estimates the ARMA parameters using a minimal set of Yule-Walker equations. In contrast, the LSMYW method utilizes the parametric estimation of an overdetermined set of Yule-Walker equations. Author (GRA)

N85-11664# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON THE RATE OF MEAN CONVERGENCE OF FINITE LINEAR PREDICTORS OF MULTIVARIATE STATIONARY STOCHASTIC PROCESSES Technical Report
M. Pourahmadi Jul. 1984 23 p
(Contract F49620-82-C-0009)
(AD-A145609; TR-69; AFOSR-84-0825TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document considers a multivariate weakly stationary stochastic process (X sub n) with the spectral density matrix f satisfying the boundedness condition, it is shown that if the entries of f are analytic functions of theta on -pi,pi, then the rate of convergence of the one-step ahead linear least squares predictor of (X sub n) based on a finite segment of the past, and the partial sum of the infinite linear least squares predictor of the process to the Kolmogorov-Wiener predictor is at least exponential. Author (GRA)

N85-11665# Missouri Univ., Columbia. Dept. of Statistics.
BAYESIAN ANALYSIS OF ITEM RESPONSE CURVES
R. K. Tsutakawa and H. Y. Lin Jul. 1984 32 p
(Contract N00014-81-K-0265)
(AD-A145627; RR-84-1; TR-132) Avail: NTIS HC A03/MF A01 CSCL 12/1

Item response curves for a set of binary responses are studied from a bayesian viewpoint of estimating the item parameters. For the two-parameter logistic model with normally distributed ability, restricted bivariate beta priors are used to illustrate the computation of the posterior mode via the EM algorithm. The procedure is illustrated by data from a mathematics test. Author (GRA)

N85-11666# North Carolina Univ., Chapel Hill. Inst. of Statistics.
AN ASYMPTOTIC THEORY FOR LOGISTIC REGRESSION WHEN SOME PREDICTORS ARE MEASURED WITH ERROR
Leonard A. Stefanski (Cornell Univ., Ithaca, N.Y.) and Raymond J. Carroll Dec. 1983 32 p
(Contract F49620-82-C-0009)
(AD-A145673; MIMEO SER-1542; AFOSR-84-0840TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document considers a local measurement error theory for logistic regression which is applied to four different methods: ordinary logistic regression without accounting for measurement error, a functional maximum likelihood estimate, an estimate based on linearizing the logistic function and an estimator conditioned on certain appropriate sufficient statistics. This asymptotic theory includes a bias-variance trade off, which is used to construct new estimators with better asymptotic and small sample properties. Author (GRA)

N85-11667# Illinois Univ., Urbana. Model Based Measurement Lab.
AN INTRODUCTION TO MULTILINEAR FORMULA SCORE THEORY
M. V. Levine 28 Aug. 1984 67 p
(Contracts N00014-79-C-0752; N00014-83-K-0397; DA Proj. RR0-4204)
(AD-A145696; MEASUREMENT/SER-84-4) Avail: NTIS

HC A04/MF A01 CSCL 12/1

Formula score theory associates each multiple choice test with a linear operator and expresses all of the real functions of item response theory as linear combinations of the operator's eigenfunctions. Hard measurement problems can then often be reformulated as easier, standard mathematical problems. For example, the problem of estimating ability distributions from sequences of item responses can be reformulated as maximizing a convex index of goodness of fit defined on a convex set. A major simplification of several theoretical problems has been obtained because the linear mathematics used by the theory has a well-developed generalization to problems involving many variables. For example, a battery of tests measuring several related variables and one test measuring one trait can be analyzed with essentially the same theory. An elementary outline of the basic theory is presented along with a discussion of several illustrative applications. Author (GRA)

N85-11668# North Carolina Univ., Chapel Hill. Chapel Hill Dept. of Statistics.
ESTIMATION IN NONLINEAR TIME SERIES MODEL II: SOME NONSTATIONARY SERIES Technical Report
D. Tjostheim Jul. 1984 45 p
(Contract F49620-82-C-0009)
(AD-A145709; TR-71; AFOSR-84-0827TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

In an earlier paper a general framework was introduced for analyzing estimates in stationary nonlinear time series models. In this present paper the framework is enlarged to include certain nonstationary and nonlinear series. General conditions for strong consistency and asymptotic normality are derived both for conditional least squares and maximum likelihood type estimates. Examples are taken from threshold autoregressive, random coefficient autoregressive and doubly stochastic (dynamic state space) models. The emphasis in the examples is on conditional least squares estimates. Author (GRA)

N85-11669# Oak Ridge National Lab., Tenn.
UNIFIED APPROACH TO SENSITIVITY AND UNCERTAINTY ANALYSIS
R. H. Gardner 1984 3 p refs Presented at Conf. on Energy, Power and Environ. Systems, San Francisco, 4 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014049; CONF-8406157-3) Avail: NTIS HC A02/MF A01

The diversity of indices for estimating the sensitivities and uncertainties of model predictions due to variations in model parameters indicates the importance of these methods for systems analysis. However, the diversity of indices also confuses the comparison of results obtained from different methods. Indices developed for small perturbations are not sufficient for models whose parameters may vary over several orders of magnitude. A unified approach to sensitivity and uncertainty analysis based on multiple regression analysis of the results of random perturbations of model parameters is presented. DOE

N85-11670# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
EQUIPARTITION THRESHOLD IN NONLINEAR LARGE HAMILTONIAN SYSTEMS: THE FERMI-PASTA-ULAM MODEL
R. Livi (Florence Univ.), M. Pettini (Osservatorio Astrofisica di Acetri, Florence), S. Ruffo (Pisa Univ.), M. DSparpaglione (Rochester Univ., N.Y.), and A. Vulpiani 27 Jan. 1984 26 p refs
(Nota-Interna-819) Avail: NTIS HC A03/MF A01

The persistence of ordered motions in the thermodynamic limit (N tends to infinity) is analyzed by studying critical energy (Ec) as a function of N and of the initial condition. Numerical experiments support the existence of an equipartition threshold for a nonlinear Hamiltonian system with a large number of degrees of freedom and its persistence as this number is increased. This threshold occurs at the same value of the control parameter, i.e., the energy density, when the number of degrees of freedom varies. The large integration times of the equation of motion suggest a frozen situation. For the N dependence results are unquestionable and in contrast with theoretical predictions, but for time dependence, it is not clear if the threshold vanishes as t approaches infinity. Moreover, an N dependence could be present at much larger times. Author (ESA)

N85-11389# South Africa Univ., Pretoria. Dept. of Statistics.
WHAT IS PRINCIPAL COMPONENTS ANALYSIS?
F. E. Steffens *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 3-16 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11390# South Africa Univ., Pretoria.
PRINCIPAL COMPONENTS: A REVIEW
M. W. Browne *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 17-23 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11391# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE INFORMATION IN THE MINOR PRINCIPAL COMPONENTS
Douglas M. Hawkins and L. Paul Fatti *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1983 p 24-43 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

N85-11392# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
DESCRIPTION OF A DATA MATRIX STRUCTURE AND MODEL DIAGNOSIS BY MEANS OF ROW AND COLUMN EUCLIDEAN MAPS
D. Bradu *In* CSIR Seminar on Principal Components Anal. in the Atmospheric and Earth Sci. 1984 p 44-59 refs (For primary document see N85-11388 02-42)
Avail: NTIS HC A09/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-11671# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OPTIMAL CONTROL OF WAITING TIME IN A M/G/1 QUEUE [CONTROLE OTIMO DO TEMPO DE ESPERA NUMA FILA M/G/1]
Antonio Fernando Branco Costa and Paulo Renato deMorais Jun. 1983 15 p refs In PORTUGUESE; ENGLISH summary Presented at the 16th Simp. Brasileiro de Pesquisa Operacional, Florianopolis, Brazil, Oct. 1983
(INPE-2767-PRE/340) Avail: NTIS HC A02/MF A01

An M/G/1 queue with two available service rates and a controlled input is addressed. A decision has to be made, at each instant of time, about which service rate to use and whether the entrance to the system should be closed or not for new arrivals. This decision is based on the residual workload (virtual waiting time), at this time, compared with critical numbers. There are customer's waiting costs, server's idleness costs, service rate switching costs, penalty costs due to lost customers, and a reward dependent upon the service rate being used. The stationary distribution of the residual workload and the average return per unit time are obtained. Numerical results are given for the M/M/1 queue, where the optimal critical values are determined so as to maximize the average return per unit time. Author

N85-11672# Massachusetts Univ., Amherst. Dept of Mathematics and Statistics.
APPLICATIONS OF FUNCTIONAL ANALYTIC AND MARTINGALE METHODS Annual Scientific Report, 15 May 1983 - 14 May 1984
W. A. Rosenkrantz Jul. 1984 4 p
(Grant AF-AFOSR-0167-82)

(AD-A145555; AFOSR-84-0718TR) Avail: NTIS HC A02/MF A01 CSCL 12/2

This annual report surveys and summarizes the principal investigator's current research on modeling and analysis of various random access protocols via Martingale and functional analytical methods. Author (GRA)

N85-11673# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.

EXPERIMENTAL STUDY WITH PARAMETER VARIATIONS ON A HYDRAULIC POSITIONING SERVO WITH COMPUTER IMPLEMENTED OBSERVER

Rolf Andemark Jul. 1984 72 p refs In SWEDISH, ENGLISH summary

(FOA-C-20545-E3; ISSN-0347-3694) Avail: NTIS HC A04/MF A01

Measurements on a computer controlled servo with an observer were made to investigate how variations of physical parameters of the system affected its function, when the corresponding parameters in the observer were held constant. An input signal was used and the corresponding response at the output was observed and compared with simulation results. By completing the observer so that it can include strength disturbances of the load, the stiffness of the system can be improved. Author (ESA)

N85-11674# Sheffield Univ. (England). Dept. of Control Engineering.

GAIN-PHASE STRUCTURES FOR LINEAR MULTIVARIABLE SYSTEMS

D. H. Owens May 1984 38 p refs

(RR-256) Avail: NTIS HC A03/MF A01

A gain-phase structure for linear multivariable systems is proposed and related to quasi-Nyquist loci and singular value decompositions, the analysis of absolute stability using positive real conditions and eigenvalue estimation using Gershgorin's theorem, and the numerical range. It is demonstrated that linear dynamic systems represented by an mxm transfer function matrix G(s) can be viewed as permitting an infinite number of gain-phase interpretations characterized by positive-definite, self-adjoint matrices Q(s), bases [xj(s)] and m scalar transfer functions gj(s), describing the input-output relationships between projections of the input onto the basis [xj] and coordinates of the output in the basis [xj]. The generality of the framework is shown by the fact that the spectral decomposition and polar decomposition of G(s) can be regarded as special forms of gain-phase structures and yet an infinity of other decompositions can exist by suitable choice of Q(s). Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-11675# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

A MATHEMATICAL THEORY OF COMMAND AND CONTROL STRUCTURES Final Report, 1 Jul. 1983 - 30 Jun. 1984

A. H. Levis 30 Aug. 1984 77 p

(Grant AF-AFOSR-0229-80)

(AD-A145608; LIDS-FR-1393; AFOSR-84-0830TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

The elements of a mathematical theory for the analysis and design of organizations are presented. The focus of the research has been on information processing and decisionmakers organizations supported by Command Control and Communications(C3) systems. The mathematical framework used in modeling the individual decisionmakers, as well as the organization, is that of n-dimensional information theory. Petri Net representation of the organizational structure is used to model the interactions between organization members as well as their interactions with the C3 system. Comparison and evaluation of alternative organizational forms is accomplished by considering organizational performance, individual workload and the sets of satisfying decision strategies. A brief description of research on distributed estimation and on information storage and flow in C3 systems is also included. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-11676# Joint Publications Research Service, Arlington, Va.

USSR REPORT: PHYSICS AND MATHEMATICS

12 Sep. 1984 161 p refs Transl. into ENGLISH from various Russian articles

(JPRS-UPM-84-006) Avail: NTIS HC A08/MF A01

Research is reported in acoustics; crystals and semiconductors; electricity and magnetism; lasers and masers; molecular physics; nuclear physics; optics and spectroscopy; electro-optics; plasma physics; thermodynamics; theoretical physics; mathematics; and stress, strain, and deformation For individual titles, see N85-11677 through N85-11736.

N85-11677# Joint Publications Research Service, Arlington, Va.

SCATTERING OF PLANE WAVE ON CYLINDRICAL SHELL IN LOW-FREQUENCY REGION Abstract Only **c32**

A. P. Paniklenko and S. A. Rybak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 3 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 2, Mar. - Apr. 1984 p 253-258 (For primary document see N85-11676 02-70)

Avail: NTIS HC A08/MF A01

The scattering amplitude of a plane wave striking an infinite cylindrical shell at an arbitrary angle in the low frequency region is analyzed. It is found that resonant properties of an infinite cylindrical shell in water will be observed in the scattered field only for shells with thickness of $n/R > 0.0004$ (for steel). No resonance will be noted in the scattered field for inner shells. The introduction of additional losses reduces the scattering amplitude at resonance, and the resonance properties become significant as the shell becomes thicker. Author

N85-11678# Joint Publications Research Service, Arlington, Va.

SLOWLY ROTATING PULSED RADIATION SOURCE Abstract Only **c32**

Yu. L. Levkovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 9 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 2, Mar. - Apr. 1984 p 238-242 (For primary document see N85-11676 02-70)

Avail: NTIS HC A08/MF A01

An approximate analytical solution is obtained for the problem of a rotating monopole such as a propeller, pump vane fan or other bladed mechanism. The radiation is assumed to be pulsed, i.e., occurring in the part of the circular trajectory that a pulse follows. The amplitude of the induced pressure when the sector within which the source radiates is small is found to be independent of the parameter L, which corresponds to the assumption of an incompressible liquid. An example illustrates the advantage of the approximate solution. Author

N85-11679# Joint Publications Research Service, Arlington, Va.

SIMILARITY CRITERIA OF SPECTRA OF PRESSURE PULSATIONS OF TURBULENT BOUNDARY LAYER NEAR WALL Abstract Only **c34**

B. M. Yefimtsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 12 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 58-61 Previously announced as N84-32059 (For primary document see N85-11676 02-70)

Avail: NTIS HC A08/MF A01

Extensive data are presented on the spectra of pressure pulsations of the turbulent boundary layer near a wall for a wide range of Mach, Reynolds and Strouhal numbers obtained through a unifieid measurement method employing detectors with good

spatial resolution. Two basic similarity criteria for the spectra of turbulent pressure pulsations near a wall are identified. Author

N85-11680# Joint Publications Research Service, Arlington, Va.
SIMULATION OF VIBRATION PROCESSES IN DAMPED STRUCTURES WITH ALLOWANCE FOR TEMPERATURE-FREQUENCY CHARACTERISTICS OF VIBRATION ABSORBING MATERIALS Abstract Only **c39**
L. Ye. Buvaylo and A. V. Ionov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 12 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 18-22 Previously announced as N84-32046 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Scale modeling is employed to examine vibration processes occurring in damped structures with allowance for the temperature and frequency characteristics of vibration absorbing materials. Laminated rods are studied as an example for the case of rigid vibration absorbing coatings (2-layered structures) and reinforced coatings or sandwich construction (3-layered structures). Allowance is made for the temperature-frequency behavior of the dynamic characteristics of viscous elastic vibration absorbing materials.
Author

N85-11681# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF RADIATION WAVELENGTH ON ELASTIC PULSE SHAPE DURING LASER EXCITATION Abstract Only **c36**
V. I. Arkhipov, A. N. Bondarenko, and A. I. Kondratyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 13 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 5-9 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The influence of radiation wavelength on the shape of laser excited elastic pulses is investigated to explain the mechanism underlying the optical generation of sound. The experimental setup is described, and the calculated values are shown to agree well with the experimental findings. The wavelength of the laser radiation is found to have a strong influence on the shape of the electric pulses, which must be taken into account in investigations of the optical generation of plastic waves. Author

N85-11682# Joint Publications Research Service, Arlington, Va.
POLARIZATION OF ULTRASOUND TRANSMITTED THROUGH BOUNDARY OF MAGNETICALLY INACTIVE AND EQUATORIALLY MAGNETIZED MEDIA Abstract Only **c71**
G. A. Babushkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 14 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 5, Sep. - Oct. 1983 p 702-704 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The polarization of all types of elastic waves passing through the interface of a nonmagnetic medium and an equatorially magnetized medium is investigated as a function of the angle of incidence of the wave on the boundary and the nature of hypotrophy of the second medium. The hypotrophy of the medium is determined phenomenologically through the effective antisymmetrical components of the tensor of the moduli of elasticity. These components are a function of the field H and the ultrasound frequency omega, and characterize the change in velocity and absorption of elastic waves in the magnetic field. The ellipticity and orientation of major axes of ellipses of polarization are investigated with respect to the refraction vectors. The findings are valid (disregarding spatial dispersion of the moduli of elasticity) for elastic isotropic crystals, polycrystals, and hexagonal crystal magnetized along the principal crystallographic axis when ultrasound propagates perpendicular to the axis. Author

N85-11683# Joint Publications Research Service, Arlington, Va.
EFFECT OF LIQUID PHASE COMPOSITION ON THICKNESS OF EPITAXIAL Ga SUB (1-x) Al SUB x As FILMS Abstract Only **c76**
N. F. Akbarov, Kh. Kh. Bustanov, M. M. Mirzabayev, I. Eshmetov, and M. N. Tursunov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 18 Transl. into ENGLISH from Izv. Akad. Nauk Ucheb. Zaved. SSR: Ser. Fiz.-Mat. Nauk (Tashkent), no. 1, Jan. - Feb. 1984 p 73-74 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The quality of the GaAs-AlAs heterojunction system multilayer structures can be improved by precise control of the thickness of the Ga(1-x)Al(x)As layers and optimization of their parameters. An experimental study was made of the dependence of the thickness of the Ga(1-x)Al(x)As layer on the aluminum content of the liquid phase of the growth process at temperature levels of 920 C, 870 C, and 820 C on gallium arsenide bases. Increase in solution aluminum content from zero to 2 at.% led to a fall in film thickness by a factor of 2.5 to 3. Anistropy of epitaxial growth was not observed. Thickness can thus be controlled by modulating aluminum content. By utilizing a limited volume of heavy solution it is possible to obtain prescribed layer thicknesses. Author

N85-11684# Joint Publications Research Service, Arlington, Va.
LUMINOUS POINTS AND BREAKDOWN IN STRUCTURE OF GaAs TRANSISTORS Abstract Only **c33**
S. G. Gasan-Zade, Ye. A. Salkov, and G. A. Shepelskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 20 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 17, no. 11, Nov. 1983 p 1931-1934 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Physical effects preceding breakdown and failure of GaAs field effect transistors were studied. Irreversible structural changes are experimentally shown to be linked to the appearance of radiation at the drain layered according to differential conductivity and forming luminous points which increase in size as the potential rises. Liquid Ga then forms and conductive channels near the brightest points at the drain lead to irreversible breakdown followed by burn-out. It is found that there are different mechanisms for point formation and Schottky barrier failure and for the drain domain failure. This is supported by the spectra since radiation from drain points is shifted to the shortwave range because of the higher space charge region field on the Schottky barrier in comparison with the drain domain field. Author

N85-11685# Joint Publications Research Service, Arlington, Va.
COMPOSITION OF METAL FILMS ON GALLIUM ARSENIDE SURFACE Abstract Only **c76**
V. G. Aleshin, V. V. Nemoshkalenko, Ye. M. Semashko, and A. I. Senkevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 20-21 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 273, no. 6, Dec. 1983 p 1345-1348 Original language doc. previously announced in IAA as A84-21094 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Nickel, tungsten, and gold films were deposited on n-type GaAs single-crystal substrates by chemical and electrochemical methods, and the composition of the films was studied by X-ray photoelectron spectroscopy. It is found that during the deposition of the films, the surface layer of the semiconductor dissociates, and As and Ga atoms are incorporated into the growing metal film. The interaction in the system metal-GaAs is complex and is largely determined by the properties of the interacting elements. The effect of the interaction on the electrophysical characteristics of metal-GaAs junctions is analyzed. V.L. (IAA)

N85-11686# Joint Publications Research Service, Arlington, Va.
IMPURITY TRAPPING DURING GAS PHASE EPITAXY OF GALLIUM ARSENIDE Abstract Only **c76**
L. G. Lavrentyeva *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 24 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Fiz. (Tomsk, USSR), v. 26, no. 10, Oct. 1983 p 31-34 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The possibility of using models of equilibrium impurity distribu-

tion between phases and nonequilibrium trapping limited by surface kinetics for describing doping principles during gallium arsenide epitaxy in chalcogenide-hydrogen systems is discussed. The equilibrium approximation is found to describe satisfactorily the nature of variation in the concentration of an atomic impurity in the gas phase near the growth surface; however, it does not reflect adequately the principles underlying the transition of the impurities from the gaseous to the solid phase. As a first approximation, the Barton-Cabreri-Frank model describes satisfactorily the kinetics of impurity trapping during gas phase epitaxy of gallium arsenide; however, the application of this model to crystallization in gas phase epitaxy systems was restricted because of the complexity of the systems and the need for taking into account the behavior of chemical reactions in relatively dense adsorption layers. Author

N85-11687# Joint Publications Research Service, Arlington, Va.
EFFECT OF LIGHT PULSES ON FILM OF CHALCOGENIDE VITREOUS SEMICONDUCTORS Abstract Only c76
A. V. Kolobov and N. Sebastyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 26 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 186-187 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Findings are presented from experiments on exposing AsSe films, in which photostructural transformations are expressed most clearly, to short light pulses (lambda = 520 nm, tau = 200 ns). The change in transmission is found to be independent of the light intensity for intensity smaller than approximately 10(5) W/sq cm, indicating that the light intensity and the number of pulses are interchangeable. The transmission is observed to change more for higher light intensities, showing increased light sensitivity. The hypothesis of a thermal mechanism underlying variation in the transmission of chalcogenide vitreous semiconductor films subjected to powerful light pulses is verified experimentally. A light intensity region is shown to exist within which the light sensitivity increases by up to two orders of magnitude. Author

N85-11688# Joint Publications Research Service, Arlington, Va.
SPECTRAL DISTRIBUTION OF RADIATION IN n JUNCTIONS OF GaAs DURING AVALANCHE BREAKDOWN Abstract Only c76
B. M. Dzelme, Ya. K. Balodis, T. Ya. Puritis, and Ya. P. Bochkans *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 28 Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR: Ser. Fiz. i Tekhn. Nauk (Riga), no. 2, Mar. - Apr. 1984 p 43-48 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The spectral distribution of GaAs p-n junctions during breakdown from small p-n junctions was studied to obtain a spectrum with less distortion. The radiation spectrum during avalanche breakdown of p-n (or n-p) GaAs junctions is wide (extending to photon energies of 3.5 eV) and smooth, with a slight maximum at energy corresponding to the width of the forbidden band of GaAs. The occurrence of a peak in the spectrum of radiation with photo energy close to that of the forbidden band of GaAs may be due to photoluminescence of the area surrounding the breakdown region. Author

N85-11689# Joint Publications Research Service, Arlington, Va.
COMPLEX FORMATION AND TEMPERATURE STABILITY OF ELECTROPHYSICAL PROPERTIES OF GaAs SEMINSULATING SINGLE CRYSTALS Abstract Only c76
A. V. Markov, S. P. Grishina, M. G. Milvidskiy, and S. S. Shifrin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 30 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 18, no. 3, Mar. 1984 p 465-470 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Single crystals of semiinsulating gallium arsenide grown on a layer of B2O3 (20 to 60 mm in diameter) with horizontally directed crystallization are investigated. It is found that annealing at temperatures below 900 C results in the formation of point defect complexes, but that complex formation is blocked in large regions about high temperature growth dislocations. Projection etching was used to establish that the annealing time for a given annealing temperature is significantly shorter for the bottom of the ingot than for the top. The complex formation rate is also higher in crystals that are grown rapidly. The connection between complex formation and variation in the electro-physical properties of the material is established; the influence of dislocations and the stability of the properties of heat treated crystals is investigated. Author

N85-11690# Joint Publications Research Service, Arlington, Va.
REVERSIBLE CHANGE IN PARAMETERS OF GaAs-BASED SURFACE-BARRIER METAL-SEMICONDUCTOR DIODES INDUCED BY HYDROGEN ABSORPTION-DESORPTION Abstract Only c76
B. B. Kuliyev, E. Yu. Salayev, and D. M. Safarov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 31 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 3, Mar. 1984 p 623-625 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A type of hydrogen-sensitive surface-barrier metal-semiconductor diode based on Pd-GaAs was fabricated and investigated. The mechanism by which hydrogen interacts with the metal-semiconductor structure was analyzed. It is found that the current-voltage and capacitance-voltage characteristics of the Pd-GaAs diode are changed reversibly by the adsorption and desorption of hydrogen, and that the diode can be used as a high sensitivity hydrogen sensor. Reversible changing of the diode parameters expands the possibility of using such surface barrier devices. Author

N85-11691# Joint Publications Research Service, Arlington, Va.
THIN FILM (Al, Ga)As HETEROJUNCTION SOLAR CELLS Abstract Only c44
V. I. Brynzar, V. V. Dorogan, M. B. Ivanov, V. G. Trofim, V. A. Chumak, and L. I. Cheban *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 32 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 8, 26 Apr. 1984 p 455-459 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Properties of pAl(x)Ga(1-x)As-nGaAs thin-film solar cells removed from GaAs substrates were investigated; the possibility of employing such cells as cascaded solar cells employing an Si cell as a narrow-band element was examined. Load characteristics and spectral photosensitivity distribution were examined for different types of cells. The development of high efficiency solar cells based on solid solutions of Al(x)Ga(1-x)As (x approx = 0.27) makes it possible to obtain overall efficiency exceeding 30% in an AlGaAs/Si cascaded solar cell. Author

N85-11692# Joint Publications Research Service, Arlington, Va.
FORMATION OF LATTICE DEFECTS BY NITROGEN LASER EXPOSURE IN A2B6 SEMICONDUCTORS WITH WIDE FORBIDDEN BAND Abstract Only c76
G. P. Yablonskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 35 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 4, Apr. 1984 p 995-1001 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The influence of irradiating ZnSe, CdS, ZnTe, CdSe and CdTe crystals with LGI-21 and M-2000 nitrogen lasers on the intensity and photoluminscence spectra at 300, 77, and 4.2 K as a function of the power density and pulse repetition frequency was investigated. It is found that structural defects occur in the surface layer of A2B6 crystals which create radiative and nonradiative recombination centers changing the quantum yield and producing new bands in the photoluminescence spectra. The most probable mechanisms underlying the occurrence of defects is photoamplified and recombination amplified processes, and as movement and propagation of dislocations. E.A.K.

N85-11693# Joint Publications Research Service, Arlington, Va.
LOW-THRESHOLD INJECTION LASERS ON GROWN GaInPAs/InP HETEROSTRUCTURES (1.2-1.6 MICROMETERS WAVELENGTHS) Abstract Only **c76**
V. P. Adveyeva, V. V. Bezotosnyy, M. G. Vasilyev, L. M. Dolginov, A. Ye. Drakin, V. P. Durayev, P. G. Yeliseyev, N. V. Malkova, M. G. Milvidskiy, B. N. Sverdlov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 35-36 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 551-557 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Injection lasers which operate at 1.2-1.6 micro wavelengths are desirable for optical communication systems which operate at 1-2 GHz carrier frequencies, which correspond to maximum attainable rates and ranges of data transmission over optical fibers. Injection lasers were developed on GaInPAs/InP isoperiodic heterostructures. It was found that a grown buried strip configuration with the active layer a dielectric strip waveguide embedded in a material with lower refractive index is nearly ideal. The performance of all these laser diodes was evaluated for superluminescence and evolution of their amplification spectra, emission spectra in the continuous wave mode, power current characteristic in continuous wave mode and in pulse mode, dependence of threshold current on width of the active strip ranging from 1-2 KA/sq cm, at 1.3 micro wavelength to 2.5 KA/sq cm, at 1.5-1.6 micro wavelengths, temperature dependence of the threshold current, and degradation of performance with rising ambient temperature. It is found that injection lasers of this kind with mode selection and transverse stabilization tend to emit radiation at a single frequency, with one longitudinal mode carrying 90% or more of the total emission power, which is very useful for high resolution spectrometry. E.A.K.

N85-11694# Joint Publications Research Service, Arlington, Va.
SYMMETRY OF EXCHANGE INTERACTION IN CRYSTALLINE MAGNETIC FILMS Abstract Only **c76**
A. Yu. Kozhukhar *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 36-37 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 1, Mar. 1984 p 71-74 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Exchange interaction and its symmetry in epitaxial crystalline ferrite-garnet films were examined by the spin wave resonance method over a wide range of temperatures. Overlapping of wave functions of magnetically active ions provides the mechanisms of such an interaction general, and electrical symmetry of octahedral and tetrahedral sublattices determines the symmetry in particular spin wave resonance were recorded with a high-resolution radiospectrometer in magnetic fields parallel or perpendicular to the normal to the film surface, at a typical frequency of 9.22 GHz at room temperatures, and the temperature dependence of splitting was measured at the same frequency over the 200 to 500 K temperature range. The exchange interaction energy was calculated. It is indicated that the exchange energy anisotropy is caused not by demagnetization but by elastic deformation of the film. This interpretation agrees with the model of anomalously differing exchange interaction constants based on domain structure and Curie temperature measurements. E.A.K.

N85-11695# Joint Publications Research Service, Arlington, Va.
PHOTOELECTRIC EFFECT IN LIQUID CRYSTALS Abstract Only **c76**
L. K. Vistin, P.-A. V. Kazlauskas, and S. Payeda *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 37-38 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 1, Mar. 1984 p 60-63 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The photoelectric effect in nematic liquid crystals with intramolecular charge transfer and wide light absorption band, was studied to determine the effect of low intensity illumination on the photoelectric properties of such crystals and particularly the photoconduction threshold in constant or low frequency alternating electric fields. It was found that the resistance depends on both intensity and spectral content of the light, and that the decrement of resistance under illumination depends on the chemical composition of the crystal. It is shown that the resistance decrement increases with better substrate surface finish and with higher degree of planar orientation. It varies with temperature and becomes maximum in an isotropic melt. The resistance decrement in crystals pretreated in a weak constant electric field increases with increasing degree of polarization. The increase of photoconduction is attributed to dissociation of excited molecules and buildup of charge carrier concentration. The shape of a photo-emf voltage pulse is different in crystals of different compositions, its amplitude also depends on the constant bias voltage. Reverse bias causes first compensation and then reversal of photo-emf voltage polarity, the crystals having a long polarity memory. E.A.K.

N85-11696# Joint Publications Research Service, Arlington, Va.
EXCITATION OF QUASI-STATIC MAGNETIC FIELDS WITH AXIAL STRUCTURE Abstract Only **c32**
A. G. Karpenko, L. A. Lobachevskiy, and V. V. Migulin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 39 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 2, Sep. 1983 p 344-346 Previously announced as N84-30873 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A quasistatic magnetic field excited in air above the sea surface by a quasisteady alternating electric current flowing through an insulated conductor in water, with water serving as the return path, was found to have not a dipole structure as in the case of a closed current loop but an axial structure as in the case of a straight wire. The intensity of such a magnetic field in air, beyond the water surrounding the conductor, is determined by the current in the conductor only and does not depend on the current in water. Measurements confirm theoretical calculations very closely, that the magnetic field intensity decreases with increasing distance from the conductor according to the inverse square rather than the inverse cube relation. This can be of practical significance for radiating stronger quasistatic magnetic fields especially at low frequencies. Author

N85-11697# Joint Publications Research Service, Arlington, Va.
TRANSFORMATION OF HETEROGENEOUS SURFACE WAVES BY SKEWED STREAMS Abstract Only **c32**
A. P. Yevdokimov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 39-40 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR: Ser. A, Fiz.-Mat. i Tekhn. Nauki (Kiev), no. 3, Mar. 1984 p 48-52 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Scattered electromagnetic fields which occur because of interaction between the surface waves of a planar dielectric waveguide with a periodic structure consisting of a skewed reflecting lattice were investigated. It is shown that the radiation portion of the spectrum of the scattered field propagates from the plane containing the direction of propagation of the heterogeneous planar dielectric waveguide wave. It is found that a critical angle exists at which the scattered field represents a heterogeneous electromagnetic wave propagating along the surface of the periodic structure. It is demonstrated that it is possible to control the propagation direction for volume and surface diffraction waves in the structure in question. E.A.K.

N85-11698# Joint Publications Research Service, Arlington, Va.
THEORY OF RADIO WAVE PROPAGATION OVER THE OCEAN Abstract Only **c32**
A. G. Bugrov, V. I. Klyatskin, and B. M. Shevtsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 40 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 6, Apr. 1984 p 1372-1376 Original language doc. previously announced in IAA as A84-37095 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Problems of ultralong range propagation in the atmosphere and waveguide propagation over the sea surface which are difficult to solve because of their boundary value nature were examined. Some boundary value problems in acoustics and radiophysics were reformulated as initial value problems that are more convenient for numerical and statistical analyses. An attempt is made to accomplish a similar task for boundary value problems of short wave propagation in the Earth's atmosphere. This is done for a simple problem, that of radio wave propagation in a spherically layered atmosphere over an ideally conducting sea surface.
Author

N85-11699# Joint Publications Research Service, Arlington, Va.
GAS DYNAMICS OF COMBUSTION OF GAS-AIR MIXTURE IN SEMI-CLOSED SPACE WITH RELIEF OF PRESSURE INTO GASLESS ADJACENT SPACE Abstract Only **c34**
P. A. Strelchuk, A. V. Mishyyev, A. G. Nikitin, and N. V. Orakhelashvili *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 41 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk, USSR), v. 20, no. 1, Jan. - Feb. 1984 p 65-69 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A physical description is presented of the processes which occur during the release of pressure from a gas filled chamber into a gasless chamber when the holes connecting the first chamber to the atmosphere are small to ensure safe pressures when the mixture contained ignites. The gas dynamics of the combustion which occur in the two chamber system was studied, and the basic factors which influence the process are identified. The model employed was a 100 liter cubic chamber divided in half by a barrier and which communicates with the atmosphere through a hole are described. The gas employed was propane. The influence of the additional chamber on the way in which the pressure in the first chamber behaves was studied. It is found that the presence of an adjacent gasless compartment leads to sharp intensification of combustion in the two chamber system, which is accompanied by alternating overflow of gases between the chambers, and that the combustion of the gas air mixture in both chambers becomes highly turbulent.
E.A.K.

N85-11700# Joint Publications Research Service, Arlington, Va.
DEVELOPED TURBULENT FLOW UNDER CONDITIONS OF INTERNAL AND EXTERNAL PROBLEMS Abstract Only **c34**
R. F. Galimzyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 45 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 171-173 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The development of a turbulent flow in a flat diffuser with boundary layers closed at the inlet is analyzed. Sequential approximation is used to solve the Prandtl equations for the region near the wall, and integral methods are used for the external region. The analytical and experimental findings are compared.
Author

N85-11701# Joint Publications Research Service, Arlington, Va.
LAMINAR-TO-TURBULENT FLOW TRANSITION UNDER INFLUENCE OF ACOUSTIC OSCILLATIONS' Abstract Only **c34**
A. N. Shelpyakov, A. M. Kasimov, and G. N. Isupov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 47 Transl. into ENGLISH from Inzh.-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 560-563 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Flow visualization with a smoke generator is employed to study the aerodynamic processes occurring during the transition between laminar and turbulent flow. Two conical flows are observed to form in the transitional segment between laminar and turbulent flows subjected to acoustic oscillations produced by a piezocrystal. The findings demonstrate the existence of acoustically differing sections within the laminar flow and a significant difference in the transition from laminar to turbulent flow caused by transverse flow and acoustic oscillations.
Author

N85-11702# Joint Publications Research Service, Arlington, Va.
PROBLEM OF REDUCTION TO IDEAL WIND TUNNEL IN EXPERIMENTAL AERODYNAMICS Abstract Only **c02**
N. N. Yanenko, Yu. Ye. Voskoboynikov, and N. G. Preobrazhenskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 48 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1309-1312 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Reduction to an ideal wind tunnel is necessary in experimental aerodynamics for elimination of the instrument error which, in the case of a wind tunnel, results from distorting stochastic perturbations caused by the flow of air. A Volterra integral equation of the first kind is derived for the probability distribution densities in a way that makes it possible to separate and exclude the instrument function characterizing the wind tunnel. The experiment thus becomes reduced to one in an ideal wind tunnel without interference. The corresponding problem for this equation is mathematically ill-conditioned and is regularized before it is solved, preferably by numerical experiment. Finiteness of interference and noise probability distribution densities, differenceness of its kernel, and inaccuracy of both its kernel and right hand side are taken into account in the algorithm of its solution. The procedure is demonstrated on evaluation of the emplitude distribution density of fluctuations in a turbulent stream flowing through a wind tunnel.
Author

N85-11703# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF MACH REFLECTION OF WEAK SHOCK WAVES Abstract Only **c02**
G. A. Makarevich, G. S. Lisenkova, N. A. Tikhomirov, and A. V. Khodtsev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 49 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 625-628 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

An experimental study was made of Mach reflection of weak shock waves, shock waves of near acoustic intensity, for the purpose of determining the dependence of pressure in the reflected wave along the wall on parameters of the incident wave: its Mach number and its angle with the wall. Measurements were made in a wind tunnel of square (250 x 250 mm) cross section and 2 m long, connected at one end to a cubical (0.5 x 0.5 x 0.5 m) test compartment and at the other end through a dielectric transition piece to a cylindrical electric-discharge chamber. Pressure measurements were made with two sets of transducers. Calibration of instruments during measurements minimized errors due to gain instability while extending the linear range of their characteristics and reducing the effect of electromagnetic interference. The diffraction pattern was photographed by the straight shadow method. Theoretical and experimental data on nonregular reflection of weak shock waves agree closely for incidence angles near the critical only, their discrepancy widening as normal incidence is approached.
Author

N85-11704# Joint Publications Research Service, Arlington, Va.
NUMERICAL ANALYSIS OF PARAMETERS OF SELF-HEATING COPPER VAPOR LASERS Abstract Only **c36**
A. F. Galkin, I. I. Klimovskiy, and L. A. Selezneva *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 51 Transl. into ENGLISH from Teplofizika Vysokikh Temperatur (Moscow), v. 21, no. 5, Sep. - Oct. 1983 p 976-981 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Numerical analysis is employed to find operating modes of self-heating copper vapor lasers with discharge tubes of different diameters, in which the coefficient of conversion of the discharge input energy to lasing energy and the average lasing power are near maximum. The optimum buffer gas pressure, discharge tube diameter, pulse recurrence rate and excitation pulse length are analyzed. The results of various studies on the optimum excitation pulse recurrence rate are compared, and the causes for reduced lasing power over time are identified.
Author

N85-11705# Joint Publications Research Service, Arlington, Va.
THE 248 nm - NEW SHORT WAVELENGTH FOR PUMPING LASERS EMPLOYING VAPORS OF COMPLEX MOLECULES Abstract Only **c36**
V. V. Gruzinskiy, K. M. Degtyarenko, T. N. Kopylova, and V. T. Pavlova *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 51-52 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Fiz. (Tomsk, USSR), v. 27, no. 4, Apr. 1984 p 118-119 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Lasing at lambda-248 nm is achieved in an excimer laser by increasing the stability of the excited molecules by using an outside gas and a compound in which the quantum yield changes little as the stored vibrational energy increases. Pentane was used in the first case, and perylene in the second. The fluorescence spectra of pure vapors of POPOP and perylene are presented. Different classes of organic compounds with which lasing at lambda=248 nm is achieved are presented. The lasing with vapors of organic compounds excited by high energy light quanta indicates the possibility of lasing with complex molecules in the short wave ultraviolet region of the spectrum, as well as the efficiency of transforming the powerful radiation from excimer lasers to the near ultraviolet and visible portion of the spectrum. Author

N85-11706# Joint Publications Research Service, Arlington, Va.
SELF-MODULATION OF INJECTION LASER EMISSION INTENSITY DUE TO EXTERNAL OPTICAL FEEDBACK Abstract Only **c36**
B. I. Smiyan, D. P. Tregub, and B. B. Elenkrig *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 54 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 198-200 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Low frequency oscillations in the radiation intensity of injection lasers caused by the introduction of optical feedback are investigated on a dual Al sub x Ca sub 1-x As-GaAs buried stripe heterolaser producing several spatial modes at lambda approximately 0.86 um. The experimental setup is described, and the oscillations in intensity of the laser radiation are analyzed and found to be of two types: sinusoidal high frequency oscillations with frequencies F sub 0, F sub 1, etc., and low frequency relaxation-type oscillations with frequencies f. Author

N85-11707# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TRANSLATIONAL AND HYPERFINE RELAXATION ON ENERGY CHARACTERISTICS OF OXYGEN-IODINE LASER Abstract Only **c36**
M. V. Zagidullin, V. I. Igoshin, and N. L. Kupriyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 55 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 382-385 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The influence of translational and hyperfine relaxation on the energy characteristics of chemical oxygen iodine lasers is investigated. In the model, a homogeneous stream of oxygen, atomic iodine, argon and extinguishing impurities moves in a uniform velocity in a flat Fabry-Perot resonator. It is found that relatively low quenching rates at pressures of 1-5 mm Hg can cause a two fold drop in the laser power. The results obtained are for single mode lasing realized in resonators with short optical length. The nonuniform broadening and finite relaxation times noted must be taken into account in the practical development of chemical oxygen lasers and in the numerical modeling of lasing kinetics. Author

N85-11708# Joint Publications Research Service, Arlington, Va.
DUAL (GaAl) As-HETEROSTRUCTURE BASED INJECTION LASER TRAVELING WAVE AMPLIFIER Abstract Only **c36**
I. S. Gondobin, V. N. Lukyanov, A. F. Solodkov, V. P. Tabunov, and S. D. Yakubovich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 56 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 375-381 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The stationary transfer characteristics and transients at heterostructure laser amplifiers are calculated on the basis of an empirical model that satisfies spontaneous emission of heterolasers at room temperature. Direct measurements of the physical parameters are made when narrow-band optical signals from an external source are input. Maximum gain of 26 dB was observed, with output signal to background ratio of 7 dB with no spectral selection, and 24 dB using an output filter with passband of 0.1 nm. The experimentally measured parameters confirm the promise of laser amplifiers for the development of new types of fiber optic communications line. Author

N85-11709# Joint Publications Research Service, Arlington, Va.
TRANSIENT OPTICAL NUTATION IN CO2 LASER Abstract Only **c36**
V. Yu. Baranov, V. L. Borzenko, S. M. Kozochkin, K. N. Makarov, D. D. Malyuta, Yu. V. Petrushevich, Yu. A. Satov, A. N. Starostin, and A. P. Streltsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 56 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 344-348 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The influence of coherent effects on amplified pulse shape is examined in detail for high pulse energy density, maximum possible gain-length product and high energy contrast of input signal employing equipment with approximately 0.15 ns temporal resolution. The experimental setup and measurement method are described. The effects of coherent interaction of a light pulse with the ambient medium influences the form of radiation in power amplifier stages where the leading edge of the pulse is approximately 0.1 ns long and the energy density is approximately 1 J/sq. cm. The observed effect in interpreted as causing oscillographically observed oscillations in pulse intensity. Author

N85-11710# Joint Publications Research Service, Arlington, Va.
OPTICAL RECORDING OF INFORMATION ON PAPER BY CO2 AND YAG-LASERS Abstract Only **c36**
S. G. Bayev, V. P. Bessemltsev, D. V. Koronkevich, and Yu. N. Tkachuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 57 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 339-344 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Methods for outputting information from computers that have the advantages of typographic printing processes, but are distinguished by the lack of an intermediate medium are investigated. Methods for recording graphic and half-tone images are investigated that are based on layers of ink deposited on the paper in advance, as well as fixing a temperature-sensitive dye on the paper by using a focused laser beam with radiation power density of .000001 w/sq.cm. to heat the surface. IR process lasers provide good efficiency and resolution. Author

N85-11711# Joint Publications Research Service, Arlington, Va.
SOLAR-PUMPED LASERS: A REVIEW Abstract Only **c36**
A. L. Golger and I. I. Klimovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 58 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 233-257 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A comparative analysis of various gas and solid state solar pumped lasers is presented. The review includes photodissociation solar pumped lasers, solar pumped laser systems employing ideal black body coatings or devices to absorb solar radiation, and solar pumped solid state lasers. The maximum efficiency, optimum transverse dimensions of the active medium and required solar energy concentration for solar pumped lasers are tabulated. Most laser arrangements can provide, under optimal conditions, maximum efficiency at the 3 to 5% level; however, all solar pumped

lasers that were developed to data have efficiency significantly lower than 1%. Author

N85-11712# Joint Publications Research Service, Arlington, Va.
SPECTRALLY MATCHED MODULATION OF RADIATION OF INJECTION LASER IN TRAVELING-WAVE AMPLIFIER BELOW 2 GHz Abstract Only **c36**
D. M. Annenkov, A. P. Bogatov, P. G. Yeliseyev, O. G. Okhotnikov, G. T. Pak, M. P. Rakhvalskiy, Yu. F. Fedorov, and K. A. Khayretdinov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 59 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2 (140), Feb. 1984 p 231-232 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

An AlGaAs laser is modulated by modulating the pumping current of a traveling wave amplifier. The experimental setup employs a single-frequency laser with an external dispersion resonator as a master oscillator. The optical spectrum width did not exceed twice the frequency of the modulating signal. Spectrally matched modulation minimizes the dispersion spreading of the light pulse, and implements special multiplexing of optical communications channels practically up to the theoretical limit. Author

N85-11713# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF ULTRASHORT PULSE GENERATION MODE OF YAG LASER Abstract Only **c36**
M. I. Demchuk, V. P. Mikhaylov, and A. F. Chernyavskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 59 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz. (Moscow), v. 48, no. 3, Mar. 1984 p 583-586 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The limiting capabilities of passive mode-locked YAG laser are estimated for existing saturated absorber components. Practical recommendations are given for synthesizing new absorber components that provide the required laser parameters. The criteria developed for selecting absorber components, taken together with the experimental findings, make it possible to optimize passive mode locking in a YAG laser, either in terms of achieving the required set of laser parameters, or in terms of achieving maximum laser capabilities with respect to any one of the parameters. A group of dyes is identified that provide maximum pulse energy and minimum pulse duration for YAG lasers. The experimental findings are in accord with the theory of passive mode locking of solid state lasers. Author

N85-11714# Joint Publications Research Service, Arlington, Va.
THEORY OF FREE-ELECTRON LASERS WITH FOCUSING PUMPING FIELD Abstract Only **c36**
N. S. Ginsburg *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 61 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 2, Feb. 1983 p 299-305 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A nonlinear theory of ubitrons and scatterons with focusing pumping field is investigated for the case of Doppler synchronism. Average electron movement equations are derived. Scattering under normal and anamalous Doppler effect conditions is analyzed. Since all electron exchange energy with the magnetic field in exactly the same way, there are a number of possibilities for improving the electron efficiency, such as varying the phase velocity of the combination waves along the instrument so that the electrons are always in the retarding phase, and exploiting recuperation of the energy of the electron beam on a collector with lower voltage. Author

N85-11715# Joint Publications Research Service, Arlington, Va.
MULTIFREQUENCY LIDAR BASED ON DYE LASER Abstract Only **c36**
L. D. Ganushkina, Ye. M. Gitlin, A. P. Ivanov, A. S. Kovalchuk, I. R. Korotkin, M. M. Loyko, F. P. Osepenko, and A. P. Chaykovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 62-63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 690-695 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The transceiving system of a field version of the Gloriya multi-frequency lidar employed for atmospheric sounding at four wavelengths simultaneously is described. The transmitter employed is based on an organic dye laser. The technical specifications of the device are presented. Test results are discussed, and the aerosol backscattering coefficient obtained is plotted as a function of wavelength. The device continues to be improved, and a special multichannel system for data recording and processing is being developed. Author

N85-11716# Joint Publications Research Service, Arlington, Va.
NARROWBAND TUNABLE DYE LASER WITH AMPLIFIER PUMPED BY POWERFUL NITROGEN LASER Abstract Only **c36**
S. N. Dorofeyev, A. G. Klimashina, V. Ye. Mnushkin, V. G. Nikiforov, B. F. Trinchuk, A. N. Tokareva, and V. A. Fedorov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 686-690 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A dye laser with a single amplification stage pumped by a nitrogen laser is investigated. The use of the laser/amplitude system significantly increases the maximum pulse power (up to 120 kW) and laser efficiency (up to 17%), and reduces the angular divergence of the laser radiation by a factor of 1.5. The technical characteristics of a device employing solutions of organic compounds and incorporating an amplifier and a radiation frequency converter are presented. M.A.C.

N85-11717# Joint Publications Research Service, Arlington, Va.
BIAXIAL-CRYSTAL LASER WITH WAVEGUIDE RESONATOR Abstract Only **c36**
B. B. Boyko, I. M. Vashkevich, Ye. A. Kashpar, I. P. Petrovich, N. N. Uvarova, and A. P. Shkadarevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 683-686 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A laser is developed employing a biaxial crystal waveguide resonator. A prototype employing a potassium/gadolinium tungstate crystal activated with neodyium ions is investigated experimentally. The waveguide resonator laser produces approximately the same power as one employing a Fabry-Perot resonator, although the threshold pumping energy of the waveguide laser is somewhat higher. Anisotropy of the crystal properties is found to have a strong influence on the lasing characteristics of the waveguide laser. The use of biaxial crystal waveguide lasers is recommended in devices with stringent requirements for divergence of the radiation in one plane. M.A.C.

N85-11718# Joint Publications Research Service, Arlington, Va.
LINEAR THEORY OF FREE-ELECTRON LASERS WITH CYLINDRICAL INTERACTION SPACE Abstract Only **c36**
N. I. Karbushev, A. A. Rukhadze, and A. D. Shatkus *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 68-69 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 534-540 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A linear theory is constructed for a free electron laser with cylindrical interaction space, a microwave device operating with a tubular relativistic electron beam. The characteristic equation for a monoenergetic beam is derived on the basis of perturbation theory, assuming an arbitrary radial profile of electron concentration in the waveguide and an infinitesimally thin electron beam tube. This equation describes stimulated radiation of the waveguide mode and includes natural oscillations of electrons. Particularly important are the Compton mode of operation with a small space charge and the Raman mode of operation with waveguide mode

and beam wave interaction, with corresponding constraints on pumping wave amplitude and electron beam current. Relations are derived for gain, efficiency, and starting current in each mode of operation with no electron concentration or velocity modulation at the entrance to the interaction space. M.A.C.

N85-11719# Joint Publications Research Service, Arlington, Va.
LASER SOURCE OF NEUTRAL ATOMS FOR COLLECTIVE-FIELD PARTICLE ACCELERATOR Abstract Only **c36**
Yu. A. Bykovskiy, V. Ye. Mironov, V. P. Sarantsev, S. M. Silnov, Ye. A. Sotnichenko, Z. A. Ter-Martirosyan, and B. A. Shestakov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 71-72 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 527-533 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Laser sources for collective-field particle accelerators, of ions of almost all chemical elements, operate in deep vacuum and in a strong alternating magnetic field. A laser source is described that can deliver an atom flux of from 10 to the 11th to 10 to the 12th power in pulses of 10-100 ms duration from a target to electron rings. Variants of the laser source are evaluated in an experimental test stand with lead, aluminum, iron, or copper used as target material. The dependence of atom flux density, mean atom concentration, and partial atom pressure on the incident radiaton power density is examined, as well as the angular distribution of atom flux density and the atom flux as function of the number of radiation/target interaction events. The results of measurements, accurate within 20%, indicate that the laser source is most effective with lead targets and least effective with copper targets. It produces atom fluxes of almost any chemical element for optimum loading of electron rings, retaining high stability of parameters and high purity through 10 to the 6th interaction events. All components are easily interchangeable for adaptation to particular chemical elements or to different electron rings, and the laser source can be easily removed for adjustment or repair. M.A.C.

N85-11720# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYDROGEN ON FORMATION OF ENERGY SPECTRUM OF MULTIPLY CHARGED AND COPPER IONS Abstract Only **c75**
M. R. Bedilov and M. S. Sabitov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 79 Transl. into ENGLISH from Izv. Akad. Nauk Ucheb. Zaved. SSR: Ser. Fiz.-Mat. Nauk (Tashkent, USSR), no. 1, Jan. - Feb. 1984 p 55-57 Original language doc. previously announced in IAA as A84-11363 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The effect of hydrogen on the energy spectrum of carbon and copper ions of a laser multielement plasma is studied. Copper and polyethelene served as hydrogen-bearing targets. Laser radiation is used for ionization with a laser time-of-flight spectrometer and electrostatic analyzer instrumentation. As hydrogen concentration in the targets increased there is a significant variation in the charge factor and width and characteristics of the copper and carbon and a special feature of the hydrogen spectrum is observed. Independently of the nature of the target, the width of the hydrogen spectrum increases with laser power until the latter reaches an optimum above which the spectrum narrows and disappears. The feature also depends upon hydrogen concentration which agrees with chemical data. Analysis of hydrogen, carbon and copper energy spectra shows differences with the hydrogen spectra narrower in the main and low range (to 350 eV) while the carbon and copper have broad spectra in high energy regions to several keV. Laser power selection can separate hydrogen from the multielement plasma and increase the intensity of copper and carbon ions. M.A.C.

N85-11721# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC SUBTRACTION OF IMAGES BY FOURIER PLANE RECORDING AND SPATIAL FILTRATION WITH A NARROW BEAM Abstract Only **c35**
I. S. Klimenko, S. N. Malov, and V. P. Ryabukho *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 79-80 refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 2, Sep. 1983 p 365-369 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A simple holographic subtraction method is described that gives a good level of image brightness consisting in obtaining double exposure Fourier holograms, recording two separate images with a small shift of the object in the transverse direction between exposures, and illumination of the hologram with a small diameter laser beam with subsequent optical Fourier transformation of the reconstructed field. Image formation is carried out with an insignificant noise background but the frying noise involved in the use of the small diameter beam is high and limits resolution of dimensions of up to approximately 0.05 mm. Image brightness is approximately two orders better than for a comparable method. M.A.C.

N85-11722# Joint Publications Research Service, Arlington, Va.
FLUCTUATIONS IN PARAMETERS OF LIGHT BEAM ALONG PATH WITH REFLECTION IN TURBULENT ATMOSPHERE Abstract Only **c74**
Yu. I. Kolilevich and G. B. Sochilin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 82 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2(240), Feb. 1984 p 315-324 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The statistical characteristics of light beams reflected from a flat mirror, corner or mirror/lens reflector, and a 90 degree prism are compared. The smooth perturbation method is used to compute the correlation function of the fluctuations in the phase, angles of arrival, amplitude levels and dispersion of random shifts in the center of gravity of a Gaussian beam reflected in a random heterogeneous medium. Expressions are derived for the correlation of the angles of arrival and dispersion of the random shifts of the center of gravity of the reflected beam, and for the dispersion of the shifts of the center of gravity of the location image of the reflector in the focal plane of a receiving lens combined with the transmitting aperture. The influence of diffraction effects on the dispersion of lateral shifts in the center of gravity of the reflected beam is illustrated. M.A.C.

N85-11723# Joint Publications Research Service, Arlington, Va.
LABORATORY INVESTIGATION OF COEFFICIENTS OF ABSORPTION OF AIR AT LAMBDA = 10.6 MICRONS Abstract Only **c46**
Yu. G. Toporkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 86 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 4, Apr. 1984 p 599-604 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The coefficients of absorption of air are determined at lambda = 10.6 microns in order to establish the contribution of different gaseous components to the overall coefficients of attenuation (absorption) and to assess aerosol influence. The experimental setup is described in detail. The recorded coefficient of attenuation of air is analyzed as a function of absolute humidity for different laser powers. The coefficients of absorption due to aerosol are found to be significant against the background of the gaseous component. Author

N85-11724# Joint Publications Research Service, Arlington, Va.
FIBER CABLE IN OPTICAL SYSTEM WITH BRIGHTNESS AMPLIFIER Abstract Only **c74**
V. S. Aleynikov, F. V. Bunkin, Ye. M. Dianov, K. I. Zemskov, M. A. Kazaryan, G. G. Petrash, A. M. Prokhorov, and V. V. Savranskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 91-92 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1373-1376 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Two basically different principles of image transmission over optical fiber cables as light guides in optical systems with brightness amplifiers are feasible, namely transmission of the original image from object to amplifier or transmission of the amplified image. The first principle can be implemented with the brightness distribution at the cable entrance either shaped directly without the aid of optics or preshaped by a lens, with respectively a solid object cable contact or a longer segment of stiff fiber cable required. A comparative evaluation of these three schemes reveals that gain is highest in the third and lowest in the first, resolution is equally high and field of vision is equally large in both, resolution being lowest and field of vision being smallest in the second scheme. Author

N85-11725# Joint Publications Research Service, Arlington, Va.
NONLINEAR SYMMETRIZATION OF PICOSECOND PULSES IN OPTICAL FIBERS Abstract Only **c74**
M. I. Demchuk, V. P. Mikhaylov, A. M. Prokhorov, I. N. Sisakyan, A. B. Shvartsburg, and K. V. Yumashev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 93-94 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 6, 26 Mar. 1984 p 338-341 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The results of initial experiments on controlled nonlinear adjustment of the envelope of a picosecond laser pulse in an optical light guide are presented. The ultrashort pulse source was a passive mode-locked YAG laser. The change in form and duration of asymmetric ultrashort pulses 25 + or - 2 and 31 + or - 2 ps long at the fiber input were investigated. Pulse symmetrization is shown to be associated with two types of spectral deformation: spectral broadening during nonstationary absorption in the thin-film gate, and self-modulation of the pulse in the fiber. Decreasing the attenuation decrement of the absorber increases the phase velocity of the signal. The role of initial modulation is shown to be more significant in the evolution of short pulses than of long ones. Part of the trailing edge of long pulses remains unmodulated, which exacerbates the tendency toward pulse spreading. Author

N85-11726# Joint Publications Research Service, Arlington, Va.
TRANSFER FUNCTION OF MULTILAYERED MAGNETOOPTICAL SPACE-TIME MODULATOR Abstract Only **c74**
M. P. Petrov and V. I. Belotitskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 94 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 115-119 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The transfer function and pulse response of a multilayered magneto-optical space-time optical modulator operating in the linear mode are found. The transfer function is found to be axisymmetric if the first layer is magnetized along the Oz axis. When the spatial frequencies are high, the absolute value of the gain drops off as exp(b [gamma]). A fundamental feature of magneto-optical space-time optical modulators is the suppression of zero-order spatial frequencies. If magnetic recording tape is used as the first layer, it is currently possible to input data to an optical circuit at up to 800,000 bits/sq cm. The low coercivity of epitaxial layers of ferrite garnets makes it possible to obtain dynamic ranges exceeding 40 dB. Author

N85-11727# Joint Publications Research Service, Arlington, Va.
FORMATION OF RADIO IMAGES BY SCANNING AROUND CIRCLE Abstract Only **c35**
A. Ch. Belyachits, P. D. Kukharchik, and V. G. Semenchik *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 98 Transl. into ENGLISH from Dokl. Akad. Belorussk. (Minsk), v. 28, no. 2, Feb. 1984 p 123-126 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A long wave holographic system with circular aperture is considered for formation of radio images. Its indeterminacy function is derived from the geometrical relations, taking into account scattering. A circular aperture of radius R is compared with a square one of area 2Rx2R, their performance being evaluated in terms of resolution with half width of the principal peak of the indeterminacy function at base (zero) level as criterion. Complete reconstruction of an image I = B(x sub s, y sub s) upon interchange of coordinates is found to be feasible, owing to the filter property of the Bessel function J sub 0. Calculations reveal that a circular aperture is more efficient than a square one, inasmuch as it requires pi times fewer samples along one coordinate. Author

N85-11728# Joint Publications Research Service, Arlington, Va.
NUMERICAL INVESTIGATION OF CHARACTERISTICS OF CURRENT FLOW FOR DIFFERENT METHODS OF OBTAINING DISCHARGE IN HIGH SPEED LASERS. MECHANISM UNDERLYING CURRENT FLOW IN POSITIVE GLOW DISCHARGE COLUMN Abstract Only **c36**
V. V. Breyev, S. V. Dvurechenskiy, and S. V. Pashkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 99 Transl. into ENGLISH from Teplofiz. Vysokikh Temperatur (Moscow), v. 21, no. 5, Sep. - Oct. 1983 p 865-870 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Positive glow discharge columns are examined for different methods of obtaining discharge from the viewpoint of the model of a nonstationary plasma; the roles of detachment and the heterogeneity factor are investigated in various experiments to study elementary discharge processes. Experimental data are interpreted from this viewpoint as well. The study includes steady state, self-maintained, and semi-self-maintained alternating current, as well as discharge in a decaying plasma. The mechanism underlying the current flow cannot be described unless allowance is made for heterogeneities in the plasma in the direction in which the current is moving. Author

N85-11729# Joint Publications Research Service, Arlington, Va.
SCATTERING OF ELECTROMAGNETIC WAVES BY PLASMA HALF-SPACE AFTER INITIATION OF MOTION Abstract Only **c75**
A. G. Nerukh *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 106 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 2, Feb. 1984 p 216-226 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The problem of the scattering of an electromagnetic wave normally incident on the plane boundary of a plasma half space initiating uniform motion perpendicular to its boundary at some arbitrary moment is solved. The problem of diffraction is reduced to scatter form, and the equation for the field that enters the plasma medium is derived by the integral equation method. The problem is solved for the case in which the plasma begins to move at time zero; subsequent solutions in space time representation are then obtained on the basis of general concepts regarding the polarization of a medium with space time dispersions. The difference between the solution of the diffraction problem for the transmitted field when movement starts at time zero and at infinity is examined. The use of the integral equation method enables identification of all characteristics of electromagnetic wave diffraction on a plasma half space that begins to move uniformly at a finite moment in time, as well as solution of such a diffraction problem. Author

N85-11730# Joint Publications Research Service, Arlington, Va.
BREMSSTRAHLUNG RADIATION FROM LONGITUDINAL PLASMA WAVES CAUSED BY SUBTHERMAL ELECTRONS IN PLASMA Abstract Only **c75**
A. V. Akopyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 108-109 Transl. into ENGLISH from Izv. Akad. Nauk Armyansk. SSR: Fiz. (Yerevan), v. 19, no. 1, Jan. - Feb. 1984 p 15-19 Previously announced as N84-32102 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Bremsstrahlung from a longitudinal plasma wave (1-wave) created during collisions of nonequilibrium subthermal electrons with the ions of an isotropic, homogeneous fully ionized plasma is

examined. Expressions are derived for the probability and intensity of the radiation for the case of electron ion pairwise collision. The problem of wave instability during collective retardation of a group of electrons on ions is discussed. Plasma waves with wavelength > or = .1 cm will grow within a characteristic time of 1/Y .01 sec for a plasma temperature of approximately .001 eV, plasma and flux densities of n (sub p) approximately 1 to the 15th power/cu cm and n (sub o) approximately 10 to the 10th power/cu cm and average flux velocity approximately 10 to the 8th power cm/sec.
Author

N85-11731# Joint Publications Research Service, Arlington, Va.
MECHANISM OF BRITTLE HEAT FRACTURE OF INHOMOGENEOUS SOLIDS BY HIGH TEMPERATURE GAS JETS Abstract Only **c39**
A. P. Dimitiyev, S. A. Goncharov, and L. N. Germanovich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 110 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 2, Sep. 1983 p 358-361 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The mechanism of brittle fracture inhomogeneous solids by high temperature gas jets occurring in heat treatment of materials, plasma spraying, heat fracture of rocks and other physico-technical processes is studied. Since fractured surface areas are significantly smaller than the dimensions of the body, an infinite half space is conceived as thermally fracturing with convective heat exchange with a gas jet on the boundary. A model of a two component random nonhomogeneous granular medium is used. Thermal stresses concentrate in a narrow surface layer where particles are thin and flat so that rupture occurs by stability loss. When the disrupted layer is sufficiently thick and temperature and heat exchange values not too high, thermal fracture occurs by peeling but when the disrupted layer thickness is small and temperature and heat exchange values high stability loss does not occur and the surface cracks. In brittle peeling, temperature goes from microfracture to fracture temperature which is less than the melting point and this pattern explains fracture mechanisms and rock behavior in thermal drilling.
Author

N85-11732# Joint Publications Research Service, Arlington, Va.
QUANTUM CHARACTERISTICS OF KINETIC FRACTURING OF SOLIDS Abstract Only **c39**
R. L. Salganik, A. I. Slutsker, and Kh. Aydarov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 111 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1362-1366 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Research on solid body kinetic fracturing shows the role of thermal fluctuation fracturing of interatomic bonds. Fracturing constitutes one of the forms of chemical solid phase reactions and has a characteristic Arrhenius ratio of reaction rate to temperature. Because of the exponential increase in the rate of interatomic bond breakdown with increasing tension, sample durability coincides logarithmically with the average expection time for interatomic bond fracture. The structure of the test material affects only the steepness of the fracture barrier as the tension increases and a drop in temperature should affect quantum characteristics of bond breakage. The resulting model is applied to larger structures and quantum features are experimentally studied in the fracturing of boron fibers and the polymers kevlar-49 and polycaprimade at temperatures from 4.2 K to 400-800 K. The results show kinetic fracturing as a process in which, at temperatures significantly lower than the characteristic temperatures for the material, a significant role is played by quantum fluctuations, while thermal fluctuation effects increase with the temperature and predominate above the characteristic temperature.
B.W.

N85-11733# Joint Publications Research Service, Arlington, Va.
EFFECTIVE MODULI OF ELASTICITY OF UNIDIRECTIONAL FIBROUS COMPOSITE Abstract Only **c24**
V. A. Molkov and B. Ye. Pobedrya *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 111 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 3, Mar. 1984 p 586-589 Original language document was announced in IAA as A84-34578 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

A sequence of two recursive problems is used to describe the theory of elasticity for composites with regular structure for the averaging method. Each problem in the first sequence is a uniform elasticity boundary value problem for which the effective moduli are found by solving the heterogeneous elasticity problems of the second sequence. The stress in each component of the composite is then found by solving the problem of effective modulus theory d(0). Exact analytical expressions for the independent components of the effective tensor of the elastic moduli of the composite are presented.
Author

N85-11734# Joint Publications Research Service, Arlington, Va.
GRAVITATIONAL VACUUM Abstract Only **c88**
L. Sh. Grigoryan and G. S. Saakyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 113 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1352-1357 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

The existence of a special gravitational vacuum is considered in this paper. A phenomenological method differing from the traditional Einsleinian formalization if utilized. Vacuum, metric and matter form a complex determined by field equations and at great distances from gravitational masses vacuum effects are small but could be large in powerful fields. Singularities and black holes justify the approach as well as the Ambartsmyan theory concerning the existence of supermassive and superdense prestallar bodies that then disintegrate. A theory for these superdense bodies is developed involving gravitational field equations that describe the vacuum by an energy momentum tensor and define the field and mass distribution. Computations based on the theory for gravitational radii with incompressible liquid models adequately reflecting real conditions indicate that a gravitational vacuum could have considerable effects on superdense stars and could have radical effects for very large masses.
B.W.

N85-11735# Joint Publications Research Service, Arlington, Va.
LINEAR CONFORMAL GRAVITATION Abstract Only **c88**
M. Ya. Palchik and Ye. S. Fradkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 114 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1345-1348 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

Conformal gravitation described by a lagrangian involving a Weyl tensor forms a field theory of interest for the quantum gravitation problem. Einsteinian gravity acting over large distances arises as a result of dynamic symmetry breaking while small distances are fully described by conformal gravitation. The latter is analyzed in the paper on the supposition that solutions have complete conformal symmetry but this is justified only for small distances and determined types of material fields. Two cases are shown for which solutions are possible: (1) special fields whose interactions result in the absence of conformal anomalies (for example, in relation to conformal supergravitation), and (2) for link constants coinciding with Gell-Mann function zeroes. Consideration is limited to linear gravitation or abelian gage theory. The solution of the quantum equation is invariant relative to the conformal transformations but contradictions arise due to difficulties in all gage theories. Recent advances in quantum electrodynamics are used. Improved transformation laws are developed and a nontrivial metric field generator is described. Representation spaces and subspaces, and equivalence and invariance characteristics are examined.
B.W.

N85-11736# Joint Publications Research Service, Arlington, Va.
METHOD OF SPLITTING FOR SOLUTION OF PROBLEMS IN SEMICONDUCTOR PHYSICS Abstract Only **c76**

Yu. A. Berezin and N. N. Yanenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 117 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1338-1340 (For primary document see N85-11676 02-70)
Avail: NTIS HC A06/MF A01

The drift-diffusion (hydrodynamic) mathematical model of a semi-conductor includes equations of continuity for electrons and holes in addition to the Poisson equation for the electric potential with space-charge density. This model is based on the premise that all parameters of a semiconductor device are functions of the instantaneous electric field intensity. In an intermediate position is the three-moment model with differential equations of transport derived from the Boltzmann equation of kinetics for the first three moments of the distribution function (density, momentum, temperature) and the collision terms calculated in accordance with the theory of scattering in semiconductors. Mathematical simulation of nonlinear and transient processes is now done by analytical and numerical methods based on the fundamental drift and diffusion equations in one-dimensional or two-dimensional formulation. An efficient implicit finite-difference scheme has been proposed with fractional steps applicable to a two-dimensional or three-dimensional system of those equations. Assuming constant electron and hole mobilities, constant permittivity of the material, zero generation of electron-hole pairs by impact ionization, and zero recombination, the system of equations is split with respect to the space coordinates as well as with respect to the two physical processes. B.W.

N85-11737# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS Abstracts Only
2 Aug. 1984 125 p Transl. into ENGLISH from various Russian articles
(JPRS-UPM-84-004) Avail: NTIS HC A06/MF A01

News items, abstracts and articles of scientific reports on aspects of physics and mathematics including acoustics, semiconductors (materials), fluid dynamics, lasers, masers, nuclear physics, spectroscopy, magnetohydrodynamics, optics, stress-strain relationships, plasma physics, thermodynamics, and mathematics are contained. For individual titles, see N85-11738 through N85-11785.

N85-11738# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY ASYMPTOTIC BEHAVIOR OF REFLECTED AND TRANSMITTED WAVES DURING SCATTERING OF SOUND BY HOLLOW ELASTIC SPHERE FILLED WITH FLUID Abstract Only c71
A. P. Poddubnyak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 1 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 6, Nov. - Dec. 1983 p 954-961 Original language document was announced as A84-19707 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The Sommerfeld-Watson transformation, the reflection method, and graph theory are used to investigate the components of an echo signal from a hollow elastic sphere with a concentric liquid filler. The components studied are those formed due to the reflection and repeated reflection of sound from the interfaces. Equations are derived which provide a way to estimate the amplitudes of the geometric echo pulses in explicit form.
V.L. (IAA)

N85-11739# Joint Publications Research Service, Arlington, Va.
COLLAPSE OF CAVITATION BUBBLES BETWEEN TWO WALLS IN ULTRASONIC FIELD Abstract Only c02
N. V. Dezhkunov, G. I. Kuvshinov, and P. P. Prokhorenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 4 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 6, Nov. - Dec. 1983 p 754-757 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

An investigation is made of the collapse of cavitation bubbles in the gap between two solid bounding surfaces based on high-speed motion picture photography. A streak camera was used to photograph light transmitted through a microscope. Exposure was frame-by-frame at a speed of .0000625 frames per second. Ultrasonic vibration was at 21.7 kHz in ordinary tap water. The solid bounding surfaces were the radiating surface of a waveguide concentrator, the polished end face of a steel cylinder, and glass plates. The experimental results and theoretical analysis show that depending on the size of the gap, the bubbles collapse with the formation of liquid microjets directed either parallel (annular jets) or perpendicular (cumulative jets) to the bounding solid surfaces. This conclusion should be taken into consideration in practice when implementing processes of ultrasonic technology involving the force action that collapse of cavitation bubbles in a gap has on solid bounding surfaces. Author

N85-11740# Joint Publications Research Service, Arlington, Va.
NONLINEAR ABSORPTION OF LASER RADIATION IN InP AND IN GaAs Abstract Only c36
R. A. Bendoryus and E. K. Maldutis *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 6 Transl. into ENGLISH from Litovsk. Fiz. Sb. (Vilnius), v. 34, no. 5, Sep. - Oct. 1983 p 92-96 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Nonlinear absorption of light in semiconductor materials with wide forbidden band is an important factor determining the feasibility of light emitting semiconductor devices based on two photon excitation. From this standpoint, an experimental study was made of nonlinear absorption in weakly laser irradiated InP and GaAs. An evaluation of the results, with interpretation based on theoretical relations for optical density and depthwise distribution of photon density, reveal that the former increases linearly in GaAs and not quite linearly in InP with increasing excitation intensity while the reflection coefficient remains constant. There is also a linear relation between the reciprocal of transmitted photon density and the reciprocal of incident photon density. With the light intensity decreasing penetration depth, there appears a linear component of absorption characteristic of one photon absorption as well as a nonlinear component. The latter is evidently attributable to other mechanisms, the most likely one being two photon absorption with attendant absorption by free charge carriers or through impurity levels of various depths. Author

N85-11741# Joint Publications Research Service, Arlington, Va.
PHOTOCURRENT OSCILLATIONS IN Bi12GeO20 METAL-SEMICONDUCTOR-METAL STRUCTURES Abstract Only c76
I. S. Zakharov and P. A. Petukhov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 7 Transl. into ENGLISH from Vyssh. Ucheb.: Fiz. (Tomsk), v. 26, no. 12, Dec. 1983 p 101-102 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Metal semiconductor metal (MSM) photosensitive structures have performance characteristics that are governed by the transient processes taking place in them when an external voltage is applied and they are exposed to light of various spectral compositions. When subjected to a short light pulse in the region of the natural absorption of the structure, in a space charge limited mode the transient process is determined by the transit of the charge carriers through the crystal. The transit time is inversely proportional to the voltage and falls in a range of tens of microseconds for typical working voltages of 300 to 500 V in bismuth sillenite chips. The behavior of the transient photocurrent in Bi12GeO20 MSM structures with chip thicknesses of 200 to 500 micrometers at working voltages of 60 to 800 V exposed to light at 400 to 600 mm was studied. Author

N85-11742# Joint Publications Research Service, Arlington, Va.
CAPACITIVE REACTANCE OF COMPENSATED SEMICONDUCTORS WITH DEEP CENTERS UNDER CONDITIONS OF TRANSMISSION OF EXCLUSION AND DOUBLE INJECTION CURRENTS Abstract Only c76
D. A. Aronov and B. R. Mamatkulov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 10-11 Transl.

into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz.-Mat. Nauk (Tashkent), no. 6, Nov. - Dec. 1983 p 32-36 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The carrier exclusion effect and the flow of double injection currents in pure and compensated semiconductors with deep centers take place under conditions of charge quasineutrality where the local change caused by these effects with electric field strength coordinate E is small compared with the space charge density of the excluded or injected nonequilibrium carriers. Since the conductivity modulation caused by these effects covers a considerable part of the crystal with dimensions reaching several hundred micrometers, and increases with increasing applied voltage V, the integral charge that is set up may be quite large, resulting in appreciable capacitance. The exclusion effect is called the exclusion capacitance, and the flow of double injection currents is called exclusion injection capacitance. The integral charge and the corresponding capacitance of a structure as a function of current or voltage are given, and the characteristics times of relaxation for the two effects are also given. Author

N85-11743# Joint Publications Research Service, Arlington, Va.
MAGNETOABSORPTION OF WEAK LIGHT WAVE IN PRESENCE OF INTENSE LIGHT WAVE IN SEMICONDUCTOR WITH NARROW FORBIDDEN BAND Abstract Only **c74**
B. S. Monozon and A. G. Zeilich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 12 Transl. into ENGLISH from Fiz. i Tekhn. Poluprov. (Leningrad), v. 17, no. 12, Dec. 1983 p 2163-2167 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

A theoretical analysis is made of interband magnetoabsorption of a weak light wave on frequency omega prime in the presence of a strong light wave with frequency omega in a semiconductor with narrow forbidden band. Both waves are identically polarized parallel to an external constant magnetic field. An analytical expression is derived for the probability of absorption of a single photon of the weak wave in transition between quasi-energy states of the conduction and valence bands that are formed by a large number of photons of the strong wave. The probabilities of a single photon transition are different in the case of an odd or even total number of photons. The ratio between them is determined by the ratio of the distance between Landau levels, which is proportional to the magnetic field, and by the width of the forbidden band. In a sufficiently strong magnetic field where the distance between Landau levels becomes commensurate with the width of the forbidden band, maxima in magnetoabsorption of a weak wave arise in a narrow band semiconductor in contrast to the case of crystals with a wide forbidden band, regardless of the evenness or oddness of the total number of photons that take part in the transition. Author

N85-11744# Joint Publications Research Service, Arlington, Va.
MECHANISMS OF LASER ANNEALING OF SEMICONDUCTORS Abstract Only **c76**
V. N. Abakumov, Zh. I. Alferov, Yu. V. Kovalchuk, and Ye. L. Portnoy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 14-15 Transl. into ENGLISH from Fiz. i Tekhn. Poluprov. (Leningrad), v. 17, no. 12, Dec. 1983 p 2224-2228 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The problem of laser annealing mechanisms are considered, and the results of previous research on the fluidity of semiconductor material exposed to millisecond and nanosecond pulses of laser radiation, as well as recent results of research on the action of picosecond light pulses are analyzed. Both the thermal and plasma models of laser annealing are considered. Experimental results are easily interpreted within the thermal model, and cannot be explained by the model of cold plasma annealing. There is no need to reject the model of thermal melting and recrystallization in pulsed laser action, even when the pulses are of picosecond duration. Under the action of ultrashort laser pulses, rapid nonequilibrium processes of a thermal type occur on the early stages of annealing, but then, as nonequilibrium is resorbed, the energy of the absorbed pulse in the final analysis will be transferred to the lattice in the layer near the surface to a thickness of the order of 1 micron and melting will occur. Author

N85-11745# Joint Publications Research Service, Arlington, Va.
PHOTOLUMINESCENT PROPERTIES OF EPITAXIAL p-GaSb Abstract Only **c76**
N. S. Zimogorova, L. M. Kanskaya, I. V. Kryachko, V. A. Sazonov, and V. I. Shostka *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 15 Transl. into ENGLISH from Fiz. i Tekhn. Poluprov. (Leningrad), v. 17, no. 12, Dec. 1983 p 2228-2230 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The photoluminescence properties of epitaxial layers of p-type gallium antimonide with and without acceptor dopants were studied. It is shown that undoped layers the background level in the epitaxial material is reduced by a decline in the concentration of natural defects which show up as a reduction in the intensity of longwave luminescence bands that predominate in the photoluminescence spectra of bulk specimens of undoped GaSb. The spectra for the doped specimens show that the activation energy is lower than predicted for a hydrogen like acceptor. At high concentrations of free carriers in doped specimens, narrowing of the forbidden band is observed and the Fermi level penetrates into the valence band. Emission intensity is reduced due to an increase in the role of Auger processes with times becoming decisive in the mechanism of recombination upon attainment of high doping levels in gallium antimonide. E.A.K.

N85-11746# Joint Publications Research Service, Arlington, Va.
DETERMINING COMPOSITION IN SURFACE REGION OF SEMICONDUCTOR CRYSTALS BY METHOD OF SUDDEN CHANGES IN X-RAY PHOTOELECTRIC EFFECT Abstract Only **c76**
V. N. Shchemelev, I. R. Tagirov, A. Buabellu, and Ye. A. Sozontov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 19 Transl. into ENGLISH from Poverkhn.: Fiz., Khim., Mekhan. (Moscow), no. 11, Nov. 1983 p 56-61 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The composition of material in the region near the surface of semiconductor solid solutions was studied by a method of sudden changes in the spectral dependence of the X-ray photoelectric effect on the absorption edges of the elemental components of the semiconductor material. X-ray photoelectric jumps are measured in germanium, gallium arsenide, and solid solutions of InxGa1-xAs with different InAs and GaAs concentrations. The composition of a solid solution at depths of formation of the photoelectric effect is determined. E.A.K.

N85-11747# Joint Publications Research Service, Arlington, Va.
INSTABILITY IN SEMICONDUCTORS EXPOSED TO IONIZING RADIATION Abstract Only **c76**
I. V. Verner, S. K. Maksimov, and V. V. Tsukanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 19 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 2, 26 Jan. 1984 p 65-68 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The possibility that exposure of semiconductors to ionizing radiation might give rise to unstable states with accumulation of point defects was analyzed. It is shown that instabilities may arise in processes of generation of interstitial atoms and vacancies, formation and dissociation of complexes of vacancies with impurity atoms, annihilation of interstitial atoms with vacancies on centers that are formed, and also interaction of interstitial atoms and vacancies with dislocations and interfaces. It is shown that the opinion that the defect profile corresponds to the depth distribution of energy expended on atomic collisions is not the only correct model. Analysis of secondary processes with consideration for irradiation of a semiconductor which gives rise to time, space, and space time dissipative structure is recommended. E.A.K.

N85-11748# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF GROWTH OF SURFACE PERIODIC STRUCTURES WHEN INTENSE LIGHT ACTS ON CONDENSED MEDIA Abstract Only **c74**
A. M. Bonch-Bruyevich, M. N. Libenson, and V. S. Makin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 22 Transl. into ENGLISH from Pisma v. Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 3-8 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The dynamics of formation of surface periodic structures that arise upon spatial modulated heating of a rough surface of a condensed medium in the interference field of a surface electromagnetic wave and the incident radiation producing it were considered. It is shown that there are several thermal mechanisms of variation of surface relief; sublimation, evaporative, hydrochemical and deformational. A common feature of all these mechanisms is a monotonic change in the local velocity of surface motion along the external normal to the unperturbed plane boundary over a wide temperature range. It is shown that conversion of incident radiation to surface electromagnetic waves is insufficient in and of itself to cause growth of surface periodic structures. There must also be a definite phase shift between the spatial distributions of the height of the cosinuosidal grating on the surface of the medium and the intensity of the absorbed radiation. If a major role in formation of the surface periodic structure is played by interference of components of the field that are parallel to the plane of the surface, the phase shift that arises when the absolute value of the real component of permittivity is much greater than the imaginary component gives weak positive feedback between the grating amplitude and the fraction of radiation converted to surface electromagnetic waves, leading to relatively slow growth of surface periodic structures. E.A.K.

N85-11749# Joint Publications Research Service, Arlington, Va.
CASCADED SOLAR PHOTOVOLTAIC CELLS BASED ON InP-GaInPAs AND InP-CdS HETEROSTRUCTURES Abstract Only **c44**
A. M. Allakhverdiyev, V. Andreyev, I. A. Guseynov, O. O. Iventyeva, and V. I. Ismailov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 23-24 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 51-55 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Cascaded solar cells with different widths of the forbidden band narrow band and wide band was studied. The narrow band cell was based on nInP-n(p)GaInPAs-pInP structure, and the wide band cell was based on pInP-nCdS heterostructure with similar lattice parameters of the contacting materials. The narrow band cells were made by liquid phase epitaxy, and the wide band cells were made by gas transport precipitation of CdS. The spectral characteristics show the feasibility of expanding the region of photosensitivity by using the principle of cascaded conversion of solar energy. The cell with pn junction in Ga0.5In0.75As0.85P0.42 utilizes light with photon energies of less than 1.35 eV that have passed without absorption through the covering photocell. The longwave limits of photosensitivity are determined by the width of the forbidden band of the active region of the corresponding photocells. The shortwave end of the spectrum is stretched out as a result of the low surface recombination rate. E.A.K.

N85-11750# Joint Publications Research Service, Arlington, Va.
FOCUSING BEAM OF 1-GeV PROTONS WITH VOLUMETRIC CAPTURE TO THE MODE OF CHANNELING BY BENT SINGLE CRYSTAL Abstract Only **c76**
V. Andreyev, V. V. Baublis, Ye. A. Damaskinskiy, A. G. Krivshich, L. G. Kudin, V. V. Marchenkov, V. F. Morozov, V. V. Nelyubin, Ye. M. Orishchin, G. Ye. Petrov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 28 Transl. into ENGLISH from Pisma v Zh. Eksperim. i Teor. Fiz. (Moscow), v. 39, no. 2, 25 Jan. 1984 p 58-61 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The ability to capture particles to the channeling mode in a range of angles that are much larger than the Lindhard angle by a bent single crystal was demonstrated. The essence of this effect, the volumetric capture, is that the conditions of capture to the channeling mode for particles may arise in the body of a crystal in regions where the particle trajectories coincide with the tangent to a bent crystallographic plane or axis. Capture is possible for particles of the incident beam inside the entire angle between tangents to the bent plane within the limits of the crystal. It is shown that particles captured into the channeling mode from a wide angle interval have a narrower angular distribution at the output from a bent crystal. Protons with 1-GeV energy in volumetric capture by the (III) plane of a bent silicon crystal from an angular interval with FWHM = 7.2 mrad had an angular divergence at the output from the crystal with FWHM = 1.6 mrad. A reduction by a factor of 1.8 was observed in the phase volume of the beam of channeled particles. E.A.K.

N85-11751# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF DETONATION WAVES EXCITED IN GAS DURING CONCENTRATED RELEASE OF ENERGY Abstract Only **c34**
A. V. Trotsyuk and V. Yu. Ulyanitskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 31 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 6, Nov. - Dec. 1983 p 76-82 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Parameters of plane and cylindrical detonation waves originating at a powerful source in a gaseous explosive medium were determined in two flat channels, one with a cross section of 10 x 10 mm for plane waves and one 400 x 180 x 10 mm with inserts forming cylindrical sectors. Measurements were made by the optical method with photodetectors recording the cellular wavefront along its entire path and, through a slit, the evolution of spontaneous glow. The measurements reveal that the dimensionless velocity of both plane and cylindrical waves declines rapidly with increasing distance from the origin and that a wavefront cell in an overcompressed cylindrical wave declines rapidly with increasing wave velocity. The results are formalized in a mathematical model describing the decay of overcompressed detonation waves, first in the approximation of instantaneous chemical reaction and then including the time delay of energy release behind the wavefront. Such a time delay, in the case of a weak energy source, reflects a detonation wave with a velocity nonmonotonically depending in the distance from that source. E.A.K.

N85-11752# Joint Publications Research Service, Arlington, Va.
LINEAR LONG-WAVE STABILITY OF CYLINDRICAL STEADY LAMINAR FLAME IN ROTATING MEDIUM Abstract Only **c25**
P. P. Lazarev and A. S. Pleshanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 31-32 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 6, Nov. - Dec. 1983 p 36-41 Original language document was announced as A84-19769 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The stability of a steady laminar flame front in a rotating medium is analyzed in the linear approximation with respect to perturbation amplitude, taking into account the effect of the centrifugal force and the Coriolis force as well as of hydrodynamic perturbations of a wavelength larger than the thermal width of the flame front. The incompressible nonviscous fluid is assumed to rotate at a constant angular velocity about the axis of the cylindrical flame. The corresponding system of equations of motion and continuity is solved for the appropriate boundary conditions at the flame front, with the flow either occurring outside the cylinder and the fuel mixture entering from a source. The solution, which in both cases converges to the Landau limit, indicates that the Coriolis force does not influence the stability of the flame front. It also confirms the physical fact that the centrifugal force raises the stability when flow occurs inside the cylinder and lowers the stability when flow occurs outside the cylinder. Author

N85-11753# Joint Publications Research Service, Arlington, Va.
NONSTEADY MOTION OF SOLID SPHERE IN COMPRESSIBLE VISCOUS FLUID Abstract Only c34
A. S. Basmat *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 32 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 19, no. 8, Aug. 1983 p 118-121 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The problem of nonsteady motion of a solid body in a fluid medium is solved for a solid sphere in a compressible viscous fluid. An approximate solution is sought through linearization of the corresponding equations of motion. A perfectly rigid sphere is assumed to move in a quiescent boundless Stokes fluid with mechanical properties characterized by density and acoustic velocity. The motion of the sphere is described in two systems of coordinates, a Cartesian one and a spherical one with common origin. Its translational motion along one of the Cartesian axes is characterized by a velocity V(t) that varies in time. The vector equation of motion is reduced to two partial differential equations for the scalar potential and the vector potential in the fluid. The solution is obtained with the aid of a Laplace transformation, assuming zero initial conditions. The drag force of the fluid is calculated with the aid of asymptotic expansion for the special case of constant acceleration. Author

N85-11754# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF PLANE POLARIZED WAVES BY NONCIRCULAR CYLINDRICAL CAVITY Abstract Only c39
V. I. Kolodiy and N. A. Shulga *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 33 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 19, no. 8, Aug. 1983 p 19-23 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Diffraction of plane waves by noncircular cylindrical cavities is analyzed by solution of the corresponding Helmholtz equations in the appropriate system of curvilinear coordinates. Such a cavity is assumed to exist inside an elastic isotropic medium through which a plane longitudinal wave propagates. With the wave potential expressed in the form of a Bessel double exponential series in two coordinates, the two Helmholtz equations reduce to an infinite system of algebraic equations for the series coefficients. For a given N this system splits into (N + 1) independent ones. It has been solved approximately, with retention of only a finite number of equations corresponding to up to 9 such terms in each of the two summations. The dynamic stress distribution around such a cavity has been calculated numerically on the basis of this solution for various wave numbers, wave frequencies, incidence angles, and cavity cross sections. The stresses are found to depend nonmonotonically on the wave number. Author

N85-11755# Joint Publications Research Service, Arlington, Va.
GEOMETRIC CHARACTERISTICS OF TURBULENT BOUNDARY LAYER SEPARATION UPON ACTION WITH DIRECT SHOCK WAVE IN CONICAL FLOWS Abstract Only c02
M. A. Zubin and N. A. Ostapenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Mar. 1984 p 38 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 6, Nov. - Dec. 1983 p 43-51 Original language document was announced as A84-19555 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

A large body of experimental data is used to analyze the effect of the separation region resulting from the incidence of a normal shock on a turbulent boundary layer in conical flow. Empirical relationships are derived for the geometric characteristics of the separation region arising during the incidence of a plane shock wave on a turbulent boundary layer in a corner and it is noted that these relationships can be used to determine the dimensions and location of the separation region with respect to the incident shock or the direction of the unperturbed flow.
B.J. (AIAA)

N85-11756# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF HEAT EXCHANGE ON MODELS IN SUBSONIC JETS OF INDUCTION PLASMATRON Abstract Only c34
A. N. Godeyev, A. F. Kolesnikov, and M. I. Yakushin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 39 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 6, Nov. - Dec. 1983 p 129-135 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The results of studies of flow parameters in an induction plasmatron and heat exchange on air cooled models in subsonic jets of dissociated air in the pressure range of 5.1000-1.0.100000 N/sq m is given. The resultant experimental data completely confirm present theoretical notions about the influence that the catalytic nature of materials has on heat exchange in dissociated air flows. Experimental data on heat flux at low pressures give an idea of the comparative catalytic activity of materials. Numerical values of the level of catalytic activity can be determined by comparing experimental data with the results of numerical analysis of heat exchange when dissociated air flows around a model with consideration of nonequilibrium chemical reactions that occur in the flow and on the surface. A numerical solution is found for the problem of flow of a subsonic jet of viscous heat conducting gas around a model of cylindrical shape with flat ends. Author

N85-11757# Joint Publications Research Service, Arlington, Va.
DENSITY DISTRIBUTION IN SUPERSONIC JET DISCHARGED INTO VACUUM FROM NOZZLE WITH BEVEL TIP Abstract Only c02
A. V. Rodionov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 39 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 6, Nov. - Dec. 1983 p 179-180 Original language document was announced as A84-19571 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

In those cases where the nozzle exit section is not perpendicular to the nozzle axis, flow in the jet becomes three dimensional. The effect of a beveled nozzle exit section can be sometimes allowed for through a correction in the density distribution. An expression for such a correction is obtained here on the basis of calculations made in an earlier study (Rodionov, 1982). V.L. (AIAA)

N85-11758# Joint Publications Research Service, Arlington, Va.
SPACE-TIME CHARACTERISTICS OF RADIATION OF SINGLE-MODE INJECTION LASERS Abstract Only c36
V. I. Borodulin, M. V. Zverkov, V. P. Konyayev, A. L. Lamanov, S. A. Pashko, M. B. Trapeznikov, and V. I. Shveykin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 40-41 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 53, no. 12, Dec. 1983 p 2408-2410 Original language document was announced as A84-44130 (For primary document see N85-11737 02-76)
Avail: NTIS HC A06/MF A01

The space-time nonuniformity of the emission of injection lasers operating in the fundamental transverse mode and having emission-region lengths less than 10 microns is investigated experimentally using the techniques described by Koval et al. (1981). The devices analyzed are GaAs/GaAlAs transverse p-n-junction or mesa-stripe-contact injection lasers with cavity lengths 200-250 microns and threshold currents 30-35 and 45-60 mA, respectively. The results are presented in graphs and discussed. It is found that the divergence of the laser light near the threshold can be determined by combining the directional patterns of the spontaneous and stimulated emissions. T.K.(IAA)

N85-11759# Joint Publications Research Service, Arlington, Va.
THEORETICAL ANALYSIS OF PHYSICAL PROCESSES OF LASING MEDIUM DEGRADATION IN SEMICONDUCTOR LASERS Abstract Only c36
P. G. Yeliseyev, I. N. Zavestovskaya, I. A. Poluektov, and Yu. M.

Popov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 44 Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. imeni P. N. Lebedeva Akad. Nauk SSSR: Inzhektsionnyye Lazery (Moscow), v. 141, 1983 p 154-185 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

While the accumulated experimental data on the degradation of semiconductor lasing media attests to the influence of excess current carrier recombination on the rate of defect reactions in the semiconductors, the mechanism of this influence is theoretically unclear. This is primarily because no specific model was worked out for the elementary event of the conversion of the electron-hole pair energy to the kinetic energy of the atom (or defect) in the lattice which allows an accurate calculation of the event probability even in cases where it is extremely low. A defect formation mechanism based on the resonant capture of an electron in the resonant repulsive state of a composite system formed by the trapping center and the electron (resonant defect-forming capture) is proposed. Author

N85-11760# Joint Publications Research Service, Arlington, Va.
STUDY OF CW INJECTION LASER WITH A DISPERSIVE EXTERNAL CAVITY Abstract Only **c36**
A. P. Bogatov, P. G. Yeliseyev, O. G. Okhotnikov, G. T. Pak, S. A. Pashko, M. P. Rakhvalskiy, and K. A. Khayretdinov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 45-46 Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. imeni P. N. Lebedeva Akad. Nauk SSSR: Inzhektsionnyye Lazery (Moscow), v. 141, 1983 p 62-88 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Double heterostructure AlGaAs/GaAs laser diodes with an active region 0.4 micrometers thick and a stripe geometry contact 10 micrometers wide are used in this study of effective single frequency lasing and the accompanying phenomena in such lasers. A detailed theoretical analysis of the spectral tuning of the laser is followed by the experimental data on bistable lasing and spectral tuning. Spectral bistability is explained and the radio frequency spectra of the laser emission intensity fluctuations as well as the properties of the beat frequency modes are also studied in detail. The phenomenon of autostabilization of the single frequency mode is found to be the result of parametric interaction of the modes; the use of this effect substantially facilitates the resolution of the problem of single frequency high power emission for nonlinear spectroscopy, holography, coherent optical communications and other applications. M.A.C.

N85-11761# Joint Publications Research Service, Arlington, Va.
INJECTION LASERS BASED ON AlGaAsSb/GaSb AND InGaAsSb/GaSb HETEROSTRUCTURES Abstract Only **c36**
L. M. Dolginov, A. Ye. Drakin, V. Drushinina, P. G. Yeliseyev, M. G. Milvidskiy, B. N. Sverdlov, and V. A. Skripkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 46-47 Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. imeni P. N. Lebedeva Akad. Nauk SSSR: Inzhektsionnyye Lazery (Moscow), v. 141, 1983 p 46-61 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Isoperiodic AlGaAsSb/GaSb and InGaSb/GaSb systems are studied in order to optimize heterostructure lasers based on these materials. Liquid phase epitaxy is used to produce double heterostructures of AlGaAsSb and InGaAsSb on GaSb n-substrates doped with Te or undoped p-substrates. The geometry, production and performance of these structures are detailed. The electroluminescence spectra of double heterostructure lasers are studied experimentally and theoretically. Calculated and experimental values of the fundamental mode beamwidth of AlGaAsSb/GaSb lasers are summarized in tabular form for wavelengths of 1,660 to 1,770 nm showing good agreement between experiment and theory. A unique feature of A3B5 semiconductors revealed in the study of InGaAsSb/GaSb is that the narrow band layer has an index of refraction in a wide range of variation in the forbidden band which is less than the index of refraction of the broadband layers. M.A.C.

N85-11762# Joint Publications Research Service, Arlington, Va.
LASER ON COPPER AND GOLD VAPORS WITH SPACE DIVERSITY MEDIA Abstract Only **c36**
G. S. Yevtushenko, A. Ye. Kirilov, Yu. P. Polunin, A. N. Soldatov, and V. F. Fedorov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 50 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 29, no. 6, Dec. 1983 p 939-944 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Energy and time characteristics of stimulated radiation in copper and gold vapors with simultaneously self limited transitions are studied experimentally under conditions designed to favor efficient emission. The temperature drop in copper and gold zones could be varied from + or - 50 to 200 K, the pressure of the inert gas could be varied from 0.5 to 20 kPa. The integral radiation spectrum of Cu+Au+Ne plasma and the energy distribution between peaks reveal an attenuation of the Ne lines as steady state emission is reached. Oscillograms of voltage pulses and transients of spontaneous emission intensity at individual spectral lines corresponding to the two modes of media diversity and recorded at various heating levels indicate the feasibility of producing a high efficiency (0.3-0.5%) high power (0.5-4 W) multifrequency laser by optimizing the active volumes and the space diversity as well as other parameters of the discharge system. Additional data are obtained with Ba+Pb+Ne and Cu+Ba+Pb+Ne media. M.A.C.

N85-11763# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF LASING DYE MEDIA IN PUMPING HIGH-POWER RADIATION WITH NANOSECOND PULSES Abstract Only **c36**
S. A. Batishche, V. A. Ganzha, N. A. Malevich, V. A. Mostovnikov, D. I. Perlov, and V. P. Shifrin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 51 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 29, no. 6, Dec. 1983 p 934-938 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The causes of laser pumping efficiency drop are investigated in an experimental study with several dye solutions. Rhodamine and oxazine solutions are excited by second harmonic emission pulses of 50 ns duration and 5 J maximum energy from a neodymium-glass laser. Polymethyne solutions are excited by second harmonic emission pulses are 20 ns duration and 5 J maximum energy from a ruby laser. The dependence of the emission efficiency on the pumping power density and on the width of the excitation zone, also of the gain and the transmission coefficient on the pumping power density is determined for rhodamines 6G and 4S, oxazine 17 in ethanol, and polymethyne No. 5364. The results reveal peaking of the efficiency and the output energy at an optimum power pumping density and at an optimum width of the excitation zone. At output power levels higher than optimum the efficiency decreases because of increasing superluminescence. M.A.C.

N85-11764# Joint Publications Research Service, Arlington, Va.
OPTICAL PROPERTIES OF LASER EROSION FLARES IN PLASMA Abstract Only **c36**
V. K. Goncharov, L. Ya. Minko, and V. I. Nasonov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 51-52 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 29, no. 6, Dec. 1983 p 930-934 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Plasma flares caused by eroding laser radiation are studied for the purpose of determining the transient characteristics and the space profiles of their optical properties. The plasma flare produced by erosion of the target and propagating against the laser beam was probed with regular radiation pulses. Large particles of the target material (with geometric dimensions larger than the radiation wavelength) within the probed flare zone, indicating almost equal scattering coefficients and almost equal absorption

coefficients at both eroding and probing laser wavelengths. They also reveal direct shielding of the eroding laser radiation by erosion products, most effectively at the target surface. M.A.C.

N85-11765# Joint Publications Research Service, Arlington, Va.
ANOMALIES IN FREQUENCY CHARACTERISTICS OF SOLID-STATE RING LASER Abstract Only **c36**
A. V. Dotsenko, Ye. G. Lariontsev, and A. N. Shelayev *In* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 57 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 20-25 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

A theoretical analysis and experimental study of the frequency characteristics of a rotating solid state ring laser with attenuation of competing interaction of opposed waves due to additional nonlinear losses are presented. The frequency responses of solid state ring lasers are considerably different from those of gas ring lasers as a result of the slow relaxation of inverse population in solid state ring lasers. A number of unusual anomalous peculiarities are in frequency characteristics of rotating solid state ring lasers with uniformly broadened luminescence line of the active substance upon attenuation of competition of opposed wave. With a change in detuning between the lines of the amplifying and absorbing media, there may be an appreciable change in the absolute value of the frequency difference of opposed waves in a rotating solid state ring laser. M.A.C.

N85-11766# Joint Publications Research Service, Arlington, Va.
OPTIMIZING CW CO2 LASERS WITH RESPECT TO OUTPUT POWER IN DIFFERENT BANDS Abstract Only **c36**
V. O. Petukhov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 59 Transl. into ENGLISH from Dokl. Akad. Nauk BSSR (Minsk), v. 27, no. 10, Oct. 1983 p 893-896 Original language document was announced as A84-11324 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Continuous-wave CO2 lasers generating at the lines of nontraditional transitions, such as 00(0)2-10(0)1, CO(0)2-02(0)1, and 01(1)1-11(1)0, are beginning to be successfully used in certain applications. A wider use of these lasers will depend on the optimization of their output parameters. It is shown here how the output power of a CW CO2 laser generating at the above transitions can be optimized by using information on the vibrational temperatures of excited CO2 molecules in the active medium. B.W.

N85-11767# Joint Publications Research Service, Arlington, Va.
RANDOM PROCESSES AND MAGNETOHYDRODYNAMIC TURBULENCE Abstract Only **c75**
A. G. Bershadskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 60 Transl. into ENGLISH from Magnitn. Gidrodinam. (Riga), no. 4, Oct. - Dec. 1983 p 87-93 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Magnetohydrodynamic turbulence is analyzed as a random process. In the case of three-dimensional turbulence with a continuous spectrum it is demonstrated that the trajectories of liquid particles are nondifferentiable. The proof is based on using the Poisson instability according to Poincare and considering a statistically steady turbulent flow within a bounded region, with S-intervals of the velocity field along the time axis. A subsequent analysis of turbulent MHD flow dynamics yields the stochastic analog of conventional MED equations. These reveal that the principal stabilizer is action of the magnetic field not on the average flow but directly on the turbulent noise. A relation between small fluctuations and the average flow is established on the basis of the perturbation theory. This relation for exponential relaxation decay of turbulence is comparable with the Prandtl hypothesis. A practical application is suppression of turbulence by a uniform magnetic field perpendicular to the solid walls of the MHD channel. Author

N85-11768# Joint Publications Research Service, Arlington, Va.
MEASURING LOCAL ION ENERGY DISTRIBUTION FUNCTION IN TUMAN-3 TOKAMAK PLASMA Abstract Only **c75**
A. V. Grigoryev, A. N. Zinovyev, A. I. Kislyakov, A. A. Korotkov, Ye. R. Krzhizhanoskiy, Yu. V. Maydl, K. G. Shakhovets, and S. G. Shchemelinin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 64 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 2, 26 Jan. 1984 p 76-80 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Two independent methods that are sensitive to different energy regions are used to study the ion energy distribution function and to determine the ion temperature on the Tuman-3 Tokamak. Both methods are based on injecting a beam of fast atoms into the plasma. Analysis of the energy spectrum of atoms formed upon charge exchange of plasma ions on atoms of the injected beam gives the distribution of ions in the region of energies greater than thermal. Measurement of the shape of the H alpha line emitted by excited atoms that arise upon charge exchange on the beam with Doppler broadening gives the distribution of ions in the region of thermal energies. The atomic beam was formed by deuterium at 14 keV, injection duration was 100 microns, and equivalent current density was 20-40 mA. sq cm. The energy spectrum of atoms formed by charge exchange of plasma ions on beam atoms was recorded by a five-channel analyzer. The shape and intensity of the H alpha line were determined by a high-transmission spectrometer with Fabry-Perot interferometer as the dispersing element. The results show that the proposed method can give information on the ion distribution function over an energy range of O-10T sub i. B.W.

N85-11769# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF VIBRATIONAL SPECTRUM AND SELECTION RULES IN RAMAN AND HYPER-RAMAN LIGHT SCATTERING SPECTRA OF INORGANIC GLASSES Abstract Only **c74**
B. G. Varshal, V. N. Denisov, B. N. Mavrin, V. G. Podobedov, and Kh. Ye. Sterin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 68 Transl. into ENGLISH from Fiz. i Khim. Stekla (Leningrad), v. 9, no. 5, Sep. - Oct. 1983 p 513-520 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

This paper puts forward a formulation and substantiation of a macroscopic approach to the interpretation of the spectra of glasses that consider the mean statistica symmetry of the medium. The influence of macroscopic symmetry in a glass on selection rules for vibrational spectra, in orientationally discorded crystals, is studied for glasses exhibiting hyper-Raman light scattering. The experimental support for the proposed model is based on observations of the frequency of vibrational polaritons as a function of the scattering angle in a number of glasses, the polarization properties of the longitudinal and transverse vibration lines in the hyper-Raman scattering spectra of SiO2 and 6TiO2 . 94SiO2 glasses, back-scattering in SiO2 glass as well as a direction comparison of the Raman and hyper-Raman scattering spectra of SiO2 and other glasses at various scattering angles. It is shown that the vibrational excitations (polaritons and purely mechanical oscillations) in these glasses are characterized by a definite wave vector. An alternative exclusion applies for the vibrational spectra of glasses, in accordance with which dipole oscillation are forbidden in Raman scattering; this exclusion is due to the macroscopic symmetry of the glass. B.W.

N85-11770# Joint Publications Research Service, Arlington, Va.
CHECKING OPTICAL-POLARIZATION MEASUREMENTS AT INTERFACES Abstract Only **c74**
Yu. I. Vologzhaninov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 69 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 19, no. 8, Aug. 1983 p 53-58 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The edge effect in optically sensitive materials and mechanical loading by the measuring devices are sources of noise and error in photoelasticity measurements by optical polarization

methods made at interfaces between two media. For checking and improving the accuracy of such measurements one needs relations between the differences of normal stresses r = sigma sub-x-sigma sub-y and between the shearing stresses tau = tau sub xy, respectively, at the boundary of and inside a medium. These relations have been established in the form of two second order differential equations in a two dimensional rectangular system of coordinates, one relating the two quantities (r,tau) obtained by measurement of stresses and compatibility of strains. These equations are subsequently solved, by the method of finite differences with a square grid, for the difference of principal stresses and the difference of optical paths. These two differences are related to the sought quantities (r,tau), through the geometry of the system, so that the latter can now be calculated precisely from readings taken at the boundary. B.W.

N85-11771# Joint Publications Research Service, Arlington, Va.
SPLITTING OF SURFACE POLARITON SPECTRUM BY HOLOGRAPHIC GRATING Abstract Only **c35**
D. N. Goryachev, N. L. Dmitruk, A. M. Kamuz, and V. H. Litovchenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 77 Transl. into ENGLISH from Poverkhn.: Fiz., Khim., Mekhan. (Moscow), no. 2, Feb. 1984 p 44-47 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The spectra of surface photon polaritons in the presence of a holographic diffraction grating on the surface of GaAs single crystals were studied. Gratings of two types were studied: with space frequency of 10 to the 2nd power/mm, and grating depth of 1.0-1.1 micro m, and with space frequency of 19/mm and grating depth of 1.5 micro m. The profile of the lines was sinusoidal. The attenuated total reflection technique was used for exciting surface phonon polaritons. The ATR spectra were taken at room temperature with two orientations of the diffraction grating relative to the plane of incidence of radiation on the coupling prism. In the first case the wave vector of the grating was parallel to the plane of incidence, and in the second - perpendicular to it. Splitting of the spectrum of surface phonon polaritons is observed, and an analysis is made of the relation between the splitting parameters and grating characteristics. B.W.

N85-11772# Joint Publications Research Service, Arlington, Va.
USING TWO-BEAM INTERFERENCE METHOD FOR MEASURING WAVELENGTH OF TUNABLE PULSE LASERS Abstract Only **c36**
V. V. Arkhipov, A. L. Kurbatov, and M. V. Shubin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 78-79 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 12, Dec. 1983 p 5-7 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Two beam interference is used to measure pulsed laser wave length. The experimental facility is based on a scanning Michelson interferometer that contains a beam splitter made from a BaF2 crystal with titanium layer, stationary and movable flat mirrors and a reference laser. In the experiment, the emission from a semiconductor injection laser was coupled through a collimator objective lens into the interferometer. At the output of the interferometer was a Ge(Hg) photocell. A wide band preamplifier matched the photocell to the external amplifier. The amplified signal was displayed on a CRT scope. The results of the experiment demonstrate the feasibility of measuring wavelength of frequency tunable lasers by the two beam interference method with a scanning Michelson interferometer and dynamic band counting. Author

N85-11773# Joint Publications Research Service, Arlington, Va.
USING FIBER-OPTICS LIGHT GUIDES IN DIAGNOSING INTENSE SHOCK WAVES Abstract Only **c74**
V. Ye. Bespalov, M. M. Bubnov, V. I. Voychenko, B. A. Demidov, Ye. M. Dianov, M. V. Ivkin, I. K. Krasyuk, P. P. Pashinin, A. M. Prokhorov, S. M. Nefedov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 83 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 55-60 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The article is a report on research for the purpose of demonstrating that the use of fiber optics light guides for coupling a study object to recording equipment avoids many experimental difficulties associated with optical methods of diagnosing intense shock waves. Multimode stepped index light guides were used. The core diameter was 50 micro m, and the outside diameter was 125 micro m. The numerical aperture of the fiber was 0.24. The fibers were encased in a polymer shell 400 micro m in diameter. The time of propagation of a shock wave was determined from emergence of the wave onto the flat or stepped surface of a target facing the light guide. Shock waves were produced by metal explosion, relativistic electron beams and laser emission. The results show that fiber optics light guides can be successfully used in experiments explicitly set up for studying intense shock wave physics. Precision techniques such as interference and polarization methods can be designed around the use of these light guides. Author

N85-11774# Joint Publications Research Service, Arlington, Va.
MODELING HOLOGRAPHIC RECOGNITION SYSTEM BY USING NUMBER-THEORY CONVOLUTION TRANSFORMATION Abstract Only **c35**
B. F. Fedorov and G. Z. Khalimov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 87 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 12, Dec. 1983 p 50-51 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The problem of computer simulation of holographic recognition systems is considered. An analysis is made of a number theory transform method for image processing where the brightness relief is represented by a matrix of binary numbers. The number theory convolution transformation method saves computer time and storage capacity in this case over fast Fourier transformation techniques since it is the amplitude response that is required at the filter output, and therefore the operations of complex multiplication and addition required by FFT are redundant. The number theory transform also gives a more exact representation of quantized data as it is not limited by the round off and overflow problems of FFT. Software limitations are considered. B.W.

N85-11775# Joint Publications Research Service, Arlington, Va.
PLASTIC DEFORMATION AND MICROSTRUCTURAL TRANSFORMATIONS OF METALS UNDER SHOCK WAVES Abstract Only **c39**
P. V. Makarov, T. M. Platova, and V. A. Skripnyak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 90-91 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 123-126 Original language document was announced as A84-14821 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

A model for the plastic deformation of metals in shock waves is proposed where separate terms are used to account for the mechanisms of defect structure transformations in the elastic precursor, in the elastic loading wave, and in the unloading wave. The model is verified experimentally by using it to calculate the propagation of plane shock waves up to 10 GPa in the aluminum alloys Al-1060, Al-6061-T6, and D-16. It is shown that the damping of the elastic precursor is associated with the nucleation of dislocations. The formation and evolution of the plastic wave front depend mainly on the multiplication of dislocations. The structure of unloading waves is determined mostly by the magnitude of the accumulated plastic deformations and the level of oriented residual stresses. B.W.

N85-11776# Joint Publications Research Service, Arlington, Va.
PROBLEMS IN THEORY OF DIFFUSION UNDER SHOCK WAVE Abstract Only **c34**
S. V. Zemskiy, V. A. Karpelyev, and Ryabchikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 91 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk),

v. 19, no. 5, Sep. - Oct. 1983 p 116-119 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

A theory of diffusion of carbon into metal is constructed, considering that a shock wave produces in a solid both reversible and irreversible strains with up to 95% of the work done on irreversible deformation converted into heat. This process is analyzed from the standpoint of thermodynamics, disregarding edge effects in a solid body such as a large thin metal plate. The equation of diffusive penetration is derived. A solution by numerical methods on a YeS-1022 Unified System digital computer yielded the logarithm of the mean integral diffusion coefficient as a function of gamma and the depth profile of carbon concentration in these two metals. R.J.F.

N85-11777# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF GEOMETRIC STABILITY OF LASER MIRROR OPTICAL SURFACE Abstract Only c74
N. A. Bochkov, V. F. Gordeyev, V. S. Kolesov, V. M. Kostin, and A. G. Lanin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 92 Transl. into ENGLISH from Poverkhn.: Fiz., Khim., Mekhan. (Moscow), no. 11, Nov. 1983 p 89-96 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06//MF A01

Parameters of stability are determined for metal surfaces used in laser optics under conditions of thermal loading with CW and pulsed operation, included with consideration of effects that are determined by finiteness of the rates of propagation of heat and elastic deformation. For the purpose of determining the critical values of stress components of the stability parameters, an experimental investigation is made of the effect that plastic deformation has on coefficients of absorption and diffuse scattering. The strain with residual longitudinal extension of 0.01% is recommended as the limit of plastic deformation, and the corresponding stresses are determined for some materials. The resultant stability parameters are used in comparative analysis of materials from the standpoint of the outlook for using them in power metallic optics. The most promising materials are silicon carbide, tungsten and molybdenum, and for lasers with pulse duration shorter than 1 ms: 32NKD invar, tungsten and molybdenum. R.J.F.

N85-11778# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF ELECTROMAGNETIC WAVE BY SCREEN OF ARBITRARY SHAPE Abstract Only c32
K. S. Shifrin, Ya. S. Shifrin, and I. A. Mikulinskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 94 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 2, 26 Jan. 1984 p 68-72 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

An analysis is made of the problem of diffraction of a plane homogeneous electromagnetic wave by a screen with arbitrary boundaries. Calculations are done in the Kirchoff approximation for the case of normal incidence of the wave on the screen for the field in the Fraunhofer zone. A formula is derived for the average intensity of the diffracted radiation that is valid for arbitrary deviations of the screen outline from circular shape. The proposed formula can also be used to solve the inverse problem of synthesizing optical and radio devices that provide an assigned distribution of average intensity. R.J.F.

N85-11779# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF LONGITUDINAL ELASTIC WAVES IN MULTILAYERED HALF-SPACE Abstract Only c39
M. B. Rasulov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 95-96 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR: Ser. Fiz.-Tekhn. i Mat. Nauk (Baku), v. 4, no. 2, Oct. - Dec. 1983 p 43-48 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The unsteady problem of one-dimensional longitudinal elastic wave propagation is solved for an arbitrary number of layers, revealing certain new mechanical effects. The model for analysis is an elastic isotropic medium filling the upper half-space and consisting of an arbitrary number of layers of different thicknesses with different properties. The medium lying on the surface of the half-space is in a state of rest. At time-zero, a force that is a given function of time acts normally to the medium, with even distribution over the entire surface. The problem reduces to solution of wave equations with given initial and boundary conditions. An analysis is made of the field in each layer set up by multiple reflections of wavefronts from the interfaces between layers. The coordinates of points of maximum stress are determined, and it is shown that the greatest stress occurs in the middle of a half-wave layer with amplitude depending on the ratios of wave impedances. A graph of this result is given for a steel layer lying on an aluminum half-space. Author

N85-11780# Joint Publications Research Service, Arlington, Va.
WEDGE WITH CRACK IN BIELASTIC MEDIUM Abstract Only c39
Yu. N. Gasanov and A. K. Mekhdiyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 96 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR: Ser. Fiz.-Tekhn. i Mat. Nauk (Baku), v. 4, no. 2, Oct. - Dec. 1983 p 53-58 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

The Wiener-Hopf method is used to find an exact solution for the plane and antiplane problem of elasticity theory where a crack of finite length emanates from the vertex of a wedge with aperture angle greater than 180 deg in a bielastic medium made up of two isotropic elastic solids interfacing in a plane. The wedge is located entirely in one elastic medium, with the tip touching the interface. It is assumed that the faces of the wedge and the edges of the crack are free of external loads. The crack extends into the second elastic medium. The corresponding asymptotic behavior at infinity is given, and the coefficients of stress intensity are determined for a crack in normal rupture and longitudinal shear. R.J.F.

N85-11781# Joint Publications Research Service, Arlington, Va.
NORMAL MODE METHOD OF SOLVING PROBLEM FORCED OSCILLATIONS OF RIB-REINFORCED SHELL OF REVOLUTION IN LIQUID Abstract Only c34
I. I. Vorovich, A. Ya. Tsionskiy, and A. S. Yudin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 98 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 6, Nov. - Dec. 1983 p 744-748 Original language document was announced as A84-44595 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

An analysis is made of steady-state low-amplitude forced oscillations of a shell of revolution with ribbed reinforcement in an ideally compressible unbounded fluid. It is assumed that the mechanical characteristics of the shell vary along the generatrix. The system of equations of the problem is written in dimensionless form for amplitudes, and expressions for circular modes are derived by Fourier trigonometric series representation of the solution. A method is given for reducing a problem to a system of linear algebraic equations relative to the coefficients of expansion of displacements only. This method was programmed in FORTRAN for the BESM-6 computer. Examples are given showing application of the method to calculation of the pressure distribution in the plane perpendicular to the axis of shells of revolution in the midsection for different frequencies of the stimulating force.Author

N85-11782# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF BURNOUT OF SOLID FUEL IN FLUIDIZED BED OF FINELY DIVIDED INERT PARTICLES Abstract Only c28
A. P. Baskokov, V. A. Munts, and A. A. Ashikhmin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 99 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 60-62 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Low-temperature combustion of coal in a fluidized bed was

studied in an experiment where the change of coal mass could be measured, by weighing, as a function of time. A bed of finely divided corundum with particles of 120 micron or 460 micron size fractions were fluidized with air in a retort containing a hollow cylinder with a welded-on grate. Specimens were placed in this bed and heated to given temperatures within 350 to 900 C in amounts calculated for complete burning out within given lengths of time. The results reveal an initially fast and then slower decrease of the coal mass with time, at rates which increase with higher temperature. The effective burnout intensity (mg/(sq cm/s)) increases almost linearly with increasing temperature, up to 400 to 500 C, and then remains constant as the temperature increases further even though the size of coal particles decreases. This, and the linear increase of the effective burnout intensity with increasing air velocity, indicates that the burnout rate is determined by diffusion of combustibles through the gaseous boundary layer rather than by the reaction kinetics. Such a hypothesis is not consistent with prevailing theory of mass transfer through fluidized beds and, therefore requires further verification. Author

N85-11783# Joint Publications Research Service, Arlington, Va.
COMBUSTION AND DETONATION OF HYDROGEN-AIR MIXTURE IN FREE SPACES Abstract Only **c25**
V. I. Makeyev, Yu. A. Gostintsev, V. V. Strogonov, Yu. A. Bokhon, Yu. N. Chernushkin, and V. N. Kulikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 100-101 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 16-18 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Hydrogen-air mixtures were held in three thin rubber balloons (6, 35, 86 cu m), with the hydrogen content in each varied over the 13 to 16% range. Combustion was triggered at the center, either weakly with a spark of 1 J energy in the two large balloons or strongly with 0.3 to 190 g charges of TNT in the small balloon. The transient buildup of flame radius and visible combustion rate were recorded, the combustion rate being also measured as a function of the hydrogen content in the mixture. It was found to be highest at 35% H2 and to increase with increasing volume. The mass of explosive charge needed for detonation was found to first decrease sharply with increasing hydrogen content in the mixture, down to a minimum of only 1.86 g at 35% H2, and then slowly increase with further increase of the hydrogen content. The excess pressure in the shock wave was found to increase linearly with increasing energy density in the spherical wave. The results indicate that transition from combustion to detonation occurs in a small volume only after strong triggering, not after weak triggering. The results reveal also a similitude of energy characteristics in the three volumes. Author

N85-11784# Joint Publications Research Service, Arlington, Va.
LIMITING EFFECTS DURING TURBULENT COMBUSTION Abstract Only **c25**
A. M. Klimov and V. N. Iebedev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 101-102 Transl. into ENGLISH from Fiz. Goreniya i Vzrvya (Novosibirsk), v. 19, no. 5, Sep. - oct. 1984 p 7-9 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Transition from surface to volume combustion is considered, taking into account turbulization in the reaction zone with attendant line and surface expansion as well as limitations on the reaction rate. These limitations are established at the leading edge of the turbulent flame front and continue to apply during surface combustion. The equations of steady expansion for a biplanar laminar flame with a plane layer of combustion products and a hollow cylindeical laminar flame with combustion products inside were solved numerically. Results indicate a significant role of these limiting effects in evolution of the flame core after spark ignition in a turbulent medium. M.G.

N85-11785# Joint Publications Research Service, Arlington, Va.
DIFFUSIVE COMBUSTION OF FLUIDS WITH FREE SURFACE Abstract Only **c25**
S. N. Milkov, G. S. Sukhov, and L. P. Yarin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 102 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk), v. 19, no. 5, Sep. - Oct. 1984 p 3-6 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

Diffusive combustion of fluids with free surface is treated and analyzed as a complex process with interdependent kinetic and dynamic effects. Calculating the fundamental characteristics of this process, namely combustion rate and coordinates of the flame front as well as temperature and concentration profiles in the flame, involves solving the system of nonlinear differential equations of heat and mass transfer without a priori knowing the values of parameters at the free surface and at the flame front. The problem is solved first for a fluid burning inside a solid container of finite dimensions with attendant shifting of its free surface and then for a finitely thick layer of burning fluid on a solid surface or on an inert fluid half-space. Integration for boundary conditions corresponding to an infinitely high reaction rate yields a description of the steady-state combustion process. Integration for initial conditions corresponding to thermal equilibrium at the free surface yields a description of the transient combustion process. M.G.

N85-11786# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF CRITICAL TEMPERATURE FOR Nb-Cu MULTILAYER FILM SUPERCONDUCTOR
X. Cai and D. Yin 25 Jul. 1984 9 p Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 32, no. 5, May 1983 p 681-684
(AD-A144321; FTD-ID(RS)T-0719-84) Avail: NTIS HC A02/MF A01 CSCL 20/3

The calculation of critical temperature for Nb-Cu multilayer film conductors without any adjustable parameters show that as the periodic character of multilayer film is considered, the theory of proximity effect agrees reasonably with experiment within the range of layer thickness d>30A. There exists damped oscillation in the dependence of critical temperature tens and, the electronic structure of the interface between Nb and Cu has an obvious influence upon tens only when d < 30 A and the strong heterogeneous inferface increases the (NV) of Nb. Author

N85-11787# Oak Ridge National Lab., Tenn.
ENGINEERING PHYSICS DIVISION Progress Report, period ending 31 Dec. 1983
F. C. Maienschein Mar. 1984 160 p
(Contract W-7405-eng-26)
(DE84-007778; ORNL-6030) Avail: NTIS HC A08/MF A01

Research summaries (182) are given under the following headings: (1) nuclear data; (2) fission reactor research; (3) fusion reactor research; (4) high-energy accelerator shielding and detector research; (5) studies of nuclear weapons effects; (6) energy economics modeling and analysis; (7) analysis of CO2 impact on climate; (8) intelligent control system research; and (9) informaton analysis and distribution. Publications and seminars are listed. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-11788*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF NOISE MEASURED FROM A PROPELLER IN A WAKE
P. J. W. Block Nov. 1984 49 p refs
(NASA-TP-2358; L-15808; NAS 1.60:2358) Avail: NTIS HC A03/MF A01 CSCL 20A

In this experimental study, the acoustic characteristics of a

propeller operating in a wake were studied. The propeller performance and noise were measured from two 0.25 scale propellers operating in an open jet anechoic flow environment with and without a wake. One propeller had NACA 16 series sections; the other, ARA-D. Wake thicknesses of 1 and 3 propeller chords were generated by an airfoil which spanned the full diameter of the propeller. The airfoil wake profiles were measured. Noise measurements were made in and out of the flow. The propellers were operated at 40, 83, and 100 inf of thrust. The acoustic data are analyzed, and the effects on the overall sound pressure level (OASPL) and scaled A weighted sound level L sub A with propeller thrust, wake thickness, and observer location are presented. The analysis showed that, generally, the wake increased the overall noise (OASPL) produced by the propeller; increased the harmonic content of the noise, thus the scaled L sub a; and produced an azimuthal dependence. With few exceptions, both propellers generally produced the same trends in delta OASPL and delta L sub a with thrust and wake thickness. Author

N85-11789*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOW-FREQUENCY SOUND ABSORPTION MEASUREMENTS IN AIR
Allan J. Zuckerwar and Roger W. Meredith (Old Dominion Univ.) Nov. 1984 48 p refs
(NASA-RP-1128; L-15831; NAS 1.61:1128) Avail: NTIS HC A03/MF A01 CSCL 20A

Thirty sets of sound absorption measurements in air at a pressure of 1 atmosphere are presented at temperatures from 10 C to 50 C, relative humidities from 0 to 100 percent, and frequencies from 10 to 2500 Hz. The measurements were conducted by the method of free decay in a resonant tube having a length of 18.261 m and bore diameter of 0.152 m. Background measurements in a gas consisting of 89.5 percent N2 and 10.5 percent Ar, a mixture which has the same sound velocity as air, permitted the wall and structural losses of the tube to be separated from the constituent absorption, consisting of classical rotational and vibrational absorption, in the air samples. The data were used to evaluate the vibrational relaxation frequencies of N2 and/or O2 for each of the 30 sets of meteorological parameters. Over the full range of humidity, the measured relaxation frequencies of N2 in air lie between those specified by ANSI Standard S1.26-1978 and those measured earlier in binary N2H2O mixtures. The measured relaxation frequencies could be determined only at very low values of humidity, reveal a significant trend away from the ANSI standard, in agreement with a prior investigation. Author

N85-11790*# Douglas Aircraft Co., Inc., Long Beach, Calif.
JET NOISE SUPPRESSION BY POROUS PLUG NOZZLES Final Report
A. B. Bauer, V. Kibens (McDonell Douglas Research Lab., St. Louis), and R. W. Wlezien (McDonnell Douglas Research Lab., St. Louis) Washington NASA Oct. 1982 173 p refs
(Contract NAS1-16284)
(NASA-CR-3613; NAS 1.26:3613; MDC-J2475) Avail: NTIS HC A08/MF A01 CSCL 20A

Jet noise suppression data presented earlier by Maestrello for porous plug nozzles were supplemented by the testing of a family of nozzles having an equivalent throat diameter of 11.77 cm. Two circular reference nozzles and eight plug nozzles having radius ratios of either 0.53 or 0.80 were tested at total pressure ratios of 1.60 to 4.00. Data were taken both with and without a forward motion or coannular flow jet, and some tests were made with a heated jet. Jet thrust was measured. The data were analyzed to show the effects of suppressor geometry on nozzle propulsive efficiency and jet noise. Aerodynamic testing of the nozzles was carried out in order to study the physical features that lead to the noise suppression. The aerodynamic flow phenomena were examined by the use of high speed shadowgraph cinematography, still shadowgraphs, extensive static pressure probe measurements, and two component laser Doppler velocimeter studies. The different measurement techniques correlated well with each other and demonstrated that the porous plug changes the shock cell structure of a standard nozzle into a series of smaller, periodic cell structures without strong shock waves. These structures become smaller in dimension and have reduced pressure variations as either the plug diameter or the porosity is increased, changes that also reduce the jet noise and decrease thrust efficiency. Author

N85-11791*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
TURBOFAN NOISE GENERATION. VOLUME 2: COMPUTER PROGRAMS Final Report
C. S. Ventres, M. A. Theobald, and W. D. Mark Jul. 1982 206 p 2 Vol.
(Contract NAS3-21252)
(NASA-CR-167952; NAS 1.26:167952; BBN-4770) Avail: NTIS HC A10/MF A01 CSCL 20A

The use of a package of computer programs developed to calculate the in duct acoustic mods excited by a fan/stator stage operating at subsonic tip speed is described. The following three noise source mechanisms are included: (1) sound generated by the rotor blades interacting with turbulence ingested into, or generated within, the inlet duct; (2) sound generated by the stator vanes interacting with the turbulent wakes of the rotor blades; and (3) sound generated by the stator vanes interacting with the velocity deficits in the mean wakes of the rotor blades. The computations for three different noise mechanisms are coded as three separate computer program packages. The computer codes are described by means of block diagrams, tables of data and variables, and example program executions; FORTRAN listings are included. M.G.

N85-11792# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
CONTRIBUTIONS TO THE 7TH INTERNATIONAL ACOUSTIC EMISSION SYMPOSIUM Technical Report
H. B. Teoh, I. Roman, M. M. Kwan, M. Shibata, and K. Ono Sep. 1984 26 p Symp. held at Zao, Japan, Oct. 1984
(Contract N00014-81-K-0011; RR0-1108)
(AD-A145368; TR-84-1) Avail: NTIS HC A03/MF A01 CSCL 20/1

The magnetomechanical acoustic emission behavior of ferromagnetic materials was investigated as a function of test temperature. The acoustic emission (AE) behavior of woven glass-epoxy composites was examined in order to characterize the various failure mechanisms operating during tensile loading. Finally, the AE behavior of A533B steel was studied during fracture tests as a function of test temperature. R.S.F.

N85-11793# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
CHORDS: A NEW TEMPERATURE OR SOUND SPEED PROFILE THINNING ALGORITHM Final Report
G. Kerr May 1984 31 p
(AD-A145464; NORDA-TN-272) Avail: NTIS HC A03/MF A01 CSCL 20/1

A new sound speed and temperature profile thinning algorithm especially designed for use with high vertical resolution (1 meter) conductivity-temperature-depth (CTD) or expendable bathythermograph (XBT) digital data is described. The thinning operation can be halted once the desired number of output points is obtained or alternatively when a user-supplied tolerance value is reached. The new algorithm has the advantage of scanning the entire profile during each iteration. As a result, unlike other thinning algorithms examined, profile curvature at depth is retained.
Author (GRA)

N85-11794# Georgia Inst. of Tech., Atlanta. Systems Engineering Lab.
AUDITORY INFORMATION SYSTEMS IN MILITARY AIRCRAFT: CURRENT CONFIGURATIONS VERSUS THE STATE OF THE ART Final Report, 1 May - 30 Sep. 1983
T. J. Doll, D. J. Folds, and L. A. Leiker Jun. 1984 122 p
(Contract F33615-82-D-0601)
(AD-A145469; USAFSAM-TR-84-15) Avail: NTIS HC A06/MF A01 CSCL 20/1

The complete ensembles of auditory signals in selected USAF aircraft (the F-4D, F-15, two models of the F-16, the C-5, and the C-141) are described and evaluated. Human factors research related to the design of speech and non-speech auditory signals is reviewed and the fundamentals of speech synthesis technology are described. Major findings are: that auditory signals are not well standardized among the aircraft, even between those with similar combat roles that a relatively large number of non-speech auditory signals are used, which may make it difficult for the aircrew to recall the meanings of all the signals; that some non-speech signals are sufficiently similar that they may be confused, particularly in high workload and stressful conditions; and that the criticality of the warnings is not reliably indicated by any characteristic of the signals. Five problem areas requiring further research are discussed: reduction of signal loudness, annoyance, and disruption of other functions; enhancement of the distinctiveness and masking resistance of non-speech signals; effects of concurrent warning signals on aircrew performance in critical operational contexts; additional uses of auditory information in order to relieve visual workload; the need for guidelines for deciding which information should be provided aurally, which should be speech versus non-speech, and for designing speech messages; and optimization of synthesized speech for cockpit applications, including its attention-getting capability, distinctiveness, intelligibility, and ease of comprehension. Author (GRA)

N85-11795# Naval Postgraduate School, Monterey, Calif.
THE ACOUSTIC PRESSURE IN A WEDGE-SHAPED WATER LAYER OVERLYING A FAST FLUID BOTTOM M.S. Thesis
C. K. Baek Mar. 1984 94 p
(AD-A145517) Avail: NTIS HC A05/MF A01 CSCL 20/1

A simple equation and computer program for the pressure and phase distributions in a wedge-shaped medium overlying a fast absorbing bottom from a point source at infinite distance from the wedge apex were formulated by using the method of images. The computer program used for calculations was tested for perfectly reflecting boundaries. A sample case using a more realistic bottom is presented and discussed. Author (GRA)

N85-11796# Tennessee Univ., Knoxville. Dept. of Physics.
NONLINEAR ACOUSTICS Annual Summary Report, 1 Dec. 1983 - 30 Nov. 1984
M. A. Breazeale Sep. 1984 8 p
(Contract N00014-81-K-0229)
(AD-A145580) Avail: NTIS HC A02/MF A01 CSCL 20/1

Nonlinear properties of solids and liquids are studied. Both pulsed and CW ultrasonic waves are used in the ultrasonic measurements which are made by electronic as well as optical techniques. Nonlinear properties of solids such as single crystal KZnF3, Ge, Si, NaCl, etc. are described in terms of third-order elastic constants which can be measured between room temperature and 4 K; those of liquids are described in terms of the ratio B/A of coefficients in the equation of state. Nonlinear diffraction theory is considered. GRA

N85-11797# Colorado School of Mines, Golden. Center for Wave Phenomena.
PROJECT REVIEW ON GEOPHYSICAL AND OCEAN SOUND SPEED PROFILE INVERSION
N. Bleistein, J. K. Cohen, J. A. DeSanto, and F. G. Hagin 1 Aug. 1984 24 p
(Contract N00014-84-K-0049)
(AD-A145717; CWP-006) Avail: NTIS HC A02/MF A01 CSCL 20/1

This report summarizes the status of the research projects on inverse problems at the Colorado School of Mines. We are engaged in two major projects in inverse problems: (I) inverse methods for reflector imaging; and (II) inverse methods for profile inversion in the ocean. In the first project we use high frequency methods to invert backscatter (monostatic) observations. Our primary applications are to seabed mapping and seismic exploration although we have also implemented our method to image flaws in solids. Computer implementation of the current algorithm is discussed, and some indication of directions for extending the method is given. A unique feature of the second project is that the direction of variation of the sound speed profile (depth) is orthogonal to the direction of propagation (range). Again, high frequency methods are used and computer implementation is briefly discussed. Keywords include: velocity inversion Born inversion, migration, stationary phase, singular function, and reflectivity function. GRA

N85-11798# Ames Lab., Iowa.
EVALUATION OF INTERFACIAL STRESSES FROM THE AMPLITUDE OF REFLECTED ULTRASONIC SIGNAL
D. K. Rehbein, J. F. Smith, and D. O. Thompson 1983 6 p refs Presented at TMS-AIME Fall Meeting, Philadelphia, 2 Oct. 1983 (Contract W-7405-eng-82)
(DE84-014572; IS-M-514; CONF-8310205-11) Avail: NTIS HC A02/MF A01

In seeking to develop a technique for quantitatively evaluating interfacial stresses, it was found that the amplitude of a reflected ultrasonic signal furnishes a useful measure. At present, the accuracy of measure is undefined because no way has been found to evaluate the true interfacial stress. Rather, the stress against which the amplitudes have been calibrated is a calculated stress based upon a two-dimensional point by point loading with an elastic-plastic model. There is semiquantitative accord between theoretical predictions and normalized data for reflection coefficient versus stress level. These results are at fixed frequency with comparable surface roughness. Variation of either frequency or surface roughness further affects the reflection coefficient. An automated scanning system was assembled to provide longitudinal and circumferential scanning and stress evaluation capability for ultrasonic study of cylindrical interfaces. DOE

N85-11799# Stuttgart Univ. (West Germany). Inst. fuer Werkzeugmaschinen.
NOISE REDUCTION OF THE EXHAUST FROM PNEUMATIC TOOLS Final Report, Sep. 1981
Guenther Lorenz Bonn Bundesministerium fuer Forschung und Technologie Sep. 1983 100 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-83-021; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Noise in the vane type air motor is examined. Pressure pulses in the exhaust, caused by the thermodynamic cycles from the chambers and their periodic exhaust, are found to be the main causes of the noise. A silencer for the discrete frequency noise was developed. It is possible to reduce the noise level of high capacity machines by $>$ 10 dB, if suitable geometrical parameters are chosen, without reducing the power output or allowing freezing of the silencer. Author (ESA)

N85-11682# Joint Publications Research Service, Arlington, Va.
POLARIZATION OF ULTRASOUND TRANSMITTED THROUGH BOUNDARY OF MAGNETICALLY INACTIVE AND EQUATORIALLY MAGNETIZED MEDIA Abstract Only
G. A. Babushkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 14 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 5, Sep. - Oct. 1983 p 702-704
(For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11738# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY ASYMPTOTIC BEHAVIOR OF REFLECTED AND TRANSMITTED WAVES DURING SCATTERING OF SOUND BY HOLLOW ELASTIC SPHERE FILLED WITH FLUID Abstract Only
A. P. Poddubnyak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 1 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 6, Nov. - Dec. 1983 p 954-961 Original language document was announced as

A84-19707 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-11800 British Library Lending Div., Boston Spa (England).
EXCHANGE AND CORRELATION EFFECTS AND PAIR POTENTIALS OF INTER-ATOMIC INTERACTION
Yu. S. Stark, S. E. Balakir, S. D. Zvonkov, and E. G. Gurskaya 18 Jul. 1984 6 p refs Transl. into ENGLISH from Izv. (USSR) p 95-97
(BLL-M-35745-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The influence of different methods of allowing for exchange and correlation effects on the form of inter-atomic pair interaction potentials was investigated. The problem was solved in the Fermi-sphere approximation for zinc. It is concluded that in calculations of effective pair potentials of inter-atomic interaction, it is essential to allow for exchange and correlation effects. R.S.F.

N85-11801# Stevens Inst. of Tech., Hoboken, N. J.
SURFACE PRODUCTION OF NEGATIVE HYDROGEN IONS Annual Scientific Report, 1 Jun. 1983 - 31 May 1984
M. Seidl 29 Jun. 1984 29 p
(Grant AF-AFOSR-0230-83)
(AD-A145437; AFOSR-84-0739TR) Avail: NTIS HC A03/MF A01 CSCL 20/7

Production of negative hydrogen ions by sputtering adsorbed hydrogen from a molybdenum surface bombarded with cesium ions has been investigated. The negative hydrogen yield (number of negative hydrogen ions sputtered per incident cesium ion) is largest when the workfunction of the surface is minimized by appropriate cesium coverage. The yield has a maximum value of 0.5 at cesium ion energy of 750 eV and approaches zero at 150 eV cesium energy. The angular distribution of the hydrogen ions is close to a Gaussian distribution with a standard deviation of 3 degrees, approximately independent of the bombarding energy. This means that the negative hydrogen ions have a Maxwellian distribution in parallel energies with a temperature between 0.3 to 0.5 percent of the bombarding energy. GRA

N85-11802# Kansas State Univ., Manhattan.
ELECTRONIC-TO-VIBRATIONAL ENERGY TRANSFER STUDIES OF SINGLET MOLECULAR OXYGEN AND HYDROGEN HALIDES Final Technical Report, Aug. 1982 - Nov. 1983
J. P. Sung, J. Bachar, and D. W. Setser Kirtland AFB, N. Mex. Air Force Weapons Lab. Jul. 1984 40 p
(Contract F29601-82-K-0088)
(AD-A145587; AFWL-TR-84-23) Avail: NTIS HC A03/MF A01 CSCL 20/8

The first two excited states of molecular oxygen are interesting candidates for electronic-to-vibrational (E-V) energy studies because high concentrations can be conveniently generated by chemical means. The iodine-oxygen chemical laser is evidence for the possible utility of singlet oxygen, if a good E-V transfer system could be discovered. Interest in reactions of singlet O2 was initially aroused in this laboratory by the accidental observation of infrared emission from HF, HCl and HBr during a study of the reaction of 0 atoms with HI. This report presents the study of E-V energy transfer from O2 to hydrogen halides and HCN at the state-to-state level. GRA

N85-11803# Avco-Everett Research Lab., Mass.
VISIBLE WAVELENGTH INTERFEROMETER FOR HIGH SPEED ELECTRON DENSITY DIAGNOSTICS Final Technical Report
D. Reilly Jun. 1984 82 p
(Contract N60921-82-C-0141)
(AD-A145686) Avail: NTIS HC A05/MF A01 CSCL 20/8

A high-speed interferometer for measuring line integrated electron-densities produced by the ETA and ATA charged particle beams has been constructed and tested. The device is configured such that only passive, radiation resistant components are in the measurement area, while the active components - detectors, electronics, and CW visible wavelength laser - are remotely grouped within a portable screened enclosure. Scene and reference beam beams communicate between the two areas over a common optical path, insensitive to atmospheric distortions. Active feedback maintains system balance. A differential detection scheme is sensitive to phase information only, reducing photon shot noise and other sources of amplitude modulation. GRA

N85-11804# Washington Univ., Seattle.
STUDY OF VIBRATIONAL ENERGY TRANSFER AT A LIQUID TIN SURFACE
W. B. Nilsson and B. S. Rabinovitch 15 Aug. 1984 21 p
(Contract N00014-75-C-0690)
(AD-A145741; AD-E001749; TR-30) Avail: NTIS HC A02/MF A01 CSCL 20/8

Single collision vibrational energy transfer for a canonical ensemble (T=300K) of cyclobutene molecules at a liquid tin surface was studied at temperatures from 500K to 775K. Transport above the reaction threshold for isomerization to butadiene was used as the criterion for efficiency of vibrational energy accommodation. The surface was found to function as a strong collider below 550 K. Experiments both above and below the freezing point revealed no discontinuity in the vibrational accommodation efficiency. GRA

N85-11805# California Univ., Livermore. Lawrence Livermore Lab.
USE OF MAGNETIC COMPRESSION BASED ON AMORPHOUS ALLOYS AS A DRIVE FOR INDUCTION LINACS
D. L. Birx, E. G. Cook, S. A. Hawkins, S. E. Poor, L. Reginato, J. Schmidt, and M. W. Smith 11 Jun. 1984 4 p refs Presented at 5th Intern. Conf. on Rapidly-Quenced Metals, Wurzburg, West Germany, 3 Sep. 1984
(Contract W-7405-eng-48)
(DE84-014524; UCRL-90788; CONF-8409107-1) Avail: NTIS HC A02/MF A01

In anticipation of current and future needs for the particle beam program and other programs at the Lawrence Livermore National Laboratory, efforts are continuing to develop high-repetition-rate magnetic pulse compressors that use ferromagnetic metallic glasses, both inthe linear and very high saturation rates. These devices are ideally suited as drivers for linear induction accelerators, where duty factor or average repetition rates (hundreds of hertz) requirements exceed the parameters that can be achieved by pulse compression using spark gaps. The technique of magnetic pulse compression has been used for several decades, but relatively recent developments in rapidly quenched magnetic metals of very thin cross sections had led to the development of state-of-the-art magnetic pulse compressors with very high peak power, repetition rates, and reliability. Results of recent experiments are described along with the relevant electrical and mechanical properties of magnetic pulse compressors to achieve high efficiency and reliability. DOE

N85-11806# Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source Dept.
USE OF A FIRST-HARMONIC RF SYSTEM IN THE NSLS BOOSTER
J. Peterson (California Univ., Lawrence Berkeley Lab.) Aug. 1984 9 p
(Contract DE-AC02-76CH-00016)
(DE84-016432; BNL-35122) Avail: NTIS HC A02/MF A01

In order to capture and accelerate the maximum amount of beam injected into the booster from the linac and to put all of this beam into one bucket of the VUV or the X-ray ring, several scenarios involving a first-harmonic RF system are considered: (1) accelerate with 5 full buckets (with the present 5th harmonic system) and coalesce the 5 bunches into one 1st harmonic bucket at flat-top, or possibly before flat top; (2) accelerate with a first harmonic (10.57 MHz) system all the way; or (3) accelerate

with a first harmonic until the bunch has damped sufficiently to transfer to one of the fifth-harmonic buckets. The capture efficiency at injection should be independent of the harmonic number of the RF system, unless there are deleterious beam-cavity interactions, in which case the first-harmonic system using ferrite could have an advantage because of its lossy characteristics at high frequencies. The acceleration efficiency should also be independent of harmonic number except at high beam intensities where collective instabilities occur. In this domain the system with lower peak beam current would be favored. As will be seen, this consideration favors the fifth-harmonic acceleration system. DOE

N85-11807# Carnegie-Mellon Univ., Pittsburgh, Pa.
EXPERIMENTAL MEDIUM ENERGY PHYSICS Annual Progress Report, Jun. 1983 - May 1984
1984 59 p
(Contracts DE-AC02-76ER-03244; EY-76-S-02-3244)
(DE84-014625; DOE/ER-03244/105) Avail: NTIS HC A04/MF A01

The principal activities of the C-MU Medium Energy Physics Group included running of previously approved experiments, the development of hardware and software for new experiments, continued analysis of previously accumulated data, and the development of model calculations to be compared with these data. Major data runs have taken place on a hypernuclear experiment (AGS 781) at the AGS, and on an antiproton run at CERN/LEAR (PS-185). In addition, planning is continuing for further hypernuclear lifetime measurements in (4) (5)He, and for a possible search for the H-particle. For these experiments extensive hardware and software development has taken place, requiring much of the group's effort. In ongoing studies of the pion annihilation mechanism, the emphasis has shifted from two-body processes to those involving three-body final states. A large effort is being devoted to the analysis of ((PI),xy) data accumulated at LAMPF on targets of (6) (7)Li, (14)N, (16)O and CD2. During the year considerable effort was devoted to Monte Carlo simulations of the rare weak decay K(+) (YIELDS) (PI) (+) nu anti nu; this experiment was approved as AGS 787. DOE

N85-11808# California Univ., Livermore. Lawrence Livermore Lab.
MULTIPURPOSE 5-MeV LINEAR INDUCTION ACCELERATOR
D. L. Birx, S. A. Hawkins, S. E. Poor, L. L. Reginato, and M. W. Smith 11 Jun. 1984 6 p Presented at the 16th IEEE Power Modulator Symp., Arlington, Va., 16-20 Jun. 1984
(Contract W-7405-eng-48)
(DE84-014523; UCRL-90554; CONF-8406137-16) Avail: NTIS HC A02/MF A01

Although linear induction accelerators (LIAs) are quite reliable by most standards, they are limited in repeating rate, average power, and reliability because the final stage of energy delivery is based on spark gap performance. In addition, they have a low duty factor of operation. To provide a higher burst rate and greater reliability, new technology was used to develop a magnetic pulse compression scheme that eliminates all spark gaps and exceeds requirements. The magnetic drive system are tailored to drive induction cells from a few kA to over 10 kA at 500 kV, with average beam power levels in the megawatts. This new 5-MeV, 2.5-kA LIA under construction at the Lawrence Livermore National Laboratory (LLNL) will be used for the development of high brightness sources and will provide a test bed for the new technology; which should lead to LIAs that surpass the radio frequency linacs for efficiency and reliability, as well as fit other industrial applications, such as sewage sterilization. DOE

N85-11809# Argonne National Lab., Ill.
WHAT FORMULAS ARE GOOD FOR REPRESENTING DIPOLE AND GENERALIZED OSCILLATOR-STRENGTH SPECTRA
Mitio Inokuti and Michael A. Dillon 1984 20 p refs Presented at the 12th Summer School and Symp. on the Phys. of Ionized Gases, Sibenik, Yugoslavia, 3 Sep. 1984
(Contract W-31-109-eng-38)
(DE84-014641; CONF-840928-1) Avail: NTIS HC A02/MF A01

The dipole oscillator-strength distribution df/depsilon for a single continuum excitation of an atom or molecule is a function of the kinetic energy epsilon of an outgoing electron. The distribution describes many optical phenomena such as absorption, refraction, and reflection; in particular, df/depsilon is equal to the cross section for ionization by a photon with energy epsilon + I, apart from an universal constant, where I is the ionization threshold for the relevant shell. Furthermore, df/depsilon governs the ionization by glancing collisions of fast charged particles. Recent years have seen considerable accumulation of experimental data on df/depsilon. Those data are indeed valuable for many aplications in radiation physics, plasma physics, atmospheric physics, and astrophysics. In most of these applications, one needs a comprehensive set of data, i.e., numerical values of df/depsilon over a wide range of epsilon, say, from several eV to many keV; most often, one needs data at all epsilon at which df/depsilon is appreciable. A method for systematizing the data so that one can extrapolate or interpolate them dependably was sought. DOE

N85-11810# Sandia Labs., Albuquerque, N. Mex.
SPIN DYNAMICS OF RARE EARTH IONS IN CRYSTAL FIELDS PROBED BY MUON SPIN ROTATION
P. M. Richards 1984 7 p refs Presented at Workshop on Elementary Excitations and Fluctuations in Magnetic Systems, San Miniato, Italy
(Contract DE-AC04-76DP-00789)
(DE84-013805; SAND-84-1131C; CONF-8405211-1) Avail: NTIS HC A02/MF A01

Muon spin rotation ((MU)SR) was used to probe the dynamics of rare-earth ions in situations where the crystal field splittings have important effects. The theory of spin dynamics in such cases is outlined and its application to (MU)SR studies in two specific systems (erbium in noble metals and holmium in LuRh4B4) is discussed. The former shows novel effects of a muon-induced axial crystal field in the otherwise cubic lattice, and the latter exhibits a dramatic change in temperature dependence because of small admixtures from the tetragonal field. DOE

N85-11811# Stanford Linear Accelerator Center, Calif.
LARGE LINEAR COLLIDERS
B. Richter Jul. 1984 14 p refs Presented at ICFA Seminar on Future Perspective in High Energy Phys., Tsukuba, Japan, 14 May 1984
(Contract DE-AC03-76SF-00515)
(DE84-015700; SU-SLAC-Pub-3371; CONF-8405218-1) Avail: NTIS HC A02/MF A01

The statue of a program to design a large linear collider at the Stanford Linear Accelerator Center is reported. Energy and luminosity requirements and design equations for the machine are discussed along with optimization of parameters. M.G.

N85-11812# Argonne National Lab., Ill.
ATLAS BEAM PROPERTIES: SOME IMPLICATIONS FOR TARGET MAKING
R. Pardo 7 Sep. 1984 14 p refs Presented at Intern. Nucl. Target Develop. Soc. Workshop, Argonne, Ill., 7 Sep. 1984
(Contract W-31-109-eng-38)
(DE84-006595; CONF-840936-1) Avail: NTIS HC A02/MF A01

The expansion of the tandem-linac booster into the Argonne Tandem-Linac Accelerator System, ATLAS, is approximately 40% complete. When completed, the facility will provide beams of heavy ions from lithium to tin with energies eventually, to 25 MeV/amu. The existing facility continues to provide beams for the experimental program in nuclear and atomic physics during the construction phase. The booster system is capable of accelerating ions as heavy as selenium to energies of 10 MeV/amu for the lighter ions. The good beam quality provided by the linac means that multiple scattering, energy straggling, and target inhomogeneities are major factors in the resolution attainable in experiments. The beam properties that are expected from ATLAS will be discussed and the present state of high resolution experiments will be reported. DOE

N85-11813# Los Alamos Scientific Lab., N. Mex.
EXPERIMENTAL CAPABILITIES AND PROSPECTS FOR MEASURING SOFT X-RAY PHOTOABSORPTION
R. J. Bartlett 1984 9 p refs Presented at Workshop on New Directions in Soft X-ray Photoabsorption, Livermore, Calif., 8 Apr. 1984
(Contract W-7405-eng-36)
(DE84-015488; LA-UR-84-2157; CONF-8404181-1) Avail: NTIS HC A02/MF A01

Absolute soft X-ray photoabsorption measurements are discussed. State of the art apparatus and techniques are brought to bear on the problem to allow measured absorption values with accuracies in the range of 1 to 5%. DOE

N85-11814# Colorado Univ., Boulder. Dept. of Physics.
DIRAC SINGLE PARTICLE WAVE FUNCTIONS IN INELASTIC ELECTRON SCATTERING
J. R. Shephard, E. Rost, E. R. Siciliano, and J. A. McNeil (Villanova Univ.) 1983 32 p refs
(Contract DE-AC02-81ER-40015)
(DE84-015129; NPL-978) Avail: NTIS HC A03/MF A01

Inelastic electron scattering using Dirac single particle wavefunctions are formulated to describe the nuclear states. The lower components of these wavefunctions are much larger than those obtained assuming a free space relation with the upper component taken to be a Schroedinger single particle wave function. The impulse approximation to the nuclear current operator is ambiguous in the present case. One of the two possible forms yields an explicitly conserved current in the single particle limit. An inelastic amplitude is identified which is linear in the lower components and is therefore very sensitive to the relativity of the bound nucleons. This amplitude is dominant for transverse isoscalar transitions. DOE

N85-11815# Brandeis Univ., Waltham, Mass. Dept. of Physics.
RESEARCH IN ELEMENTARY PARTICLE PHYSICS Technical Progress Report, 1 Jun. 1983 - 31 May 1984
L. H. Kirsch, H. J. Schnitzer, J R. Bensinger, and L. F. Abbott 1984 25 p refs
(Contract DE-AC02-76ER-03230)
(DE84-013520; DOE/ER-03230/T3) Avail: NTIS HC A02/MF A01

Ongoing and completed research concerning the theoretical and experimental properties of elementary particles is presented and described briefly. Specific topics addressed include: meson spectroscopy, composite particle models, skyrmions, cosmic microwave background radiation, the background field method, and quantum gravity. In addition, the Kaluza-Klein theories, lattice gauge theories, and CP violation are considered. R.S.F.

N85-11816# Stanford Linear Accelerator Center, Calif.
SLC NOMENCLATURE FOR BEAMLINE COMPONENTS
J. Paterson and J. Silva 12 Jul. 1984 8 p refs
(Contract DE-AC03-76SF-00515)
(DE84-014776; SU-SLAC-CN-273) Avail: NTIS HC A02/MF A01

The Stanford Linear Collider nomenclature conventions for beamline components are documented. Included are recent enhancements which should lead to a more consistant usage of the unit number part of beamline device names. The first section is a brief summary for the general user.The second section is a more amplified description for those who need more detailed interpretations of device names. The third section contains a few notes for those who must generate device names for new components. DOE

N85-11817# Rome Univ. (Italy). Ist. di Fisica.
RESULTS ON WEAK CURRENT FROM CHARM COLLABORATION
B. Borgia 7 Sep. 1983 18 p refs Presented at Europhys. Study Conf. on Electroweak Interactions at High Energies, Erice, Italy, 1983
(Nota-Interna-810) Avail: NTIS HC A02/MF A01

The fine grained calorimeter of the CHARM experiment was used to measure fundamental quantities of neutral current interactions as the coupling constants to quarks and leptons. Results derived from neutrino interactions on nuclei and on electrons are presented. Author (ESA)

N85-11818# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
INTERACTIONS IN LOCALIZATION
C. DiCastro 29 Nov. 1983 7 p refs Presented at Worskhop on Topics in the Phys. of Disorder, Santa Barbara, CA., 15-26 Aug., 1983
(Nota-Interna-815) Avail: NTIS HC A02/MF A01

Effective couplings in disordered electronic systems undergoing a metal-insulator transition by increasing the amount of disorder are discussed. Localization theories and theories of particle interaction are summarized. Author (ESA)

N85-11819# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
ELECTRONS IN A DISORDERED MEDIUM
C. Castellani and C. DiCastro 28 Nov. 1983 39 p refs Submitted for publication
(Nota-Interna-816) Avail: NTIS HC A03/MF A01

The localization problem of free electron gas in a disordered medium is reviewed. The phenomenological scaling theory of the Anderson transition, based on inverse conductance coupling, is recalled. Perturbative analysis of the system is described. Infinite resummations in the interaction and renormalized perturbation theory are discussed. Author (ESA)

N85-11820# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
CONSTRAINTS TO THE RADIATIVE LIFETIME OF A LIGHT NEUTRAL FERMION IN THE GALACTIC HALO FROM IUE
G. Auriemma, F. Bochicchio, A. Frenkel, and F. Massa 12 Dec. 1983 19 p refs Presented at Workshop on Galactic and Extragalactic Dark Matter, Rome, 28 Jun. 1983
(Nota-Interna-817) Avail: NTIS HC A02/MF A01

The negative result of a search for radiative decay of a light neutral fermion, that might be the neutrino (if massive) or the photino, gravitationally bound to our Galaxy is discussed. The limit obtained for a particle of mass between 12.5 and 21.5 eV is 10 to the 18th power yr. Data on UV background in the range 1250 to 2000 A show the presence of continuum emission and diffuse line emission at high galactic latitude, identifiable with the lines C IV at 1549 A, and N III at 1749 A. The continuum level sharply rises at 1680 A, to 1700 + or - 250 ph/sq cm sec str A and remains constant up to 2000 A. Below 1680 A, no emission is found with an upper limit of 300 units. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

No abstracts in this category.

74 OPTICS

Includes light phenomena.

N85-11821 United Kingdom Atomic Energy Authority, Risley (England).
THEORETICAL ELEMENTS OF PHOTOMETRY
J. Dourgnon 18 Oct. 1984 41 p refs Transl. into ENGLISH from Rev. Gen. de l'Elec. (France), v. 41, 1937 p 619-633
(BLL-Risley-TR-5022-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The general concepts are presented which appear to be

essential for an understanding of the present state of development of lighting technology. A definition of photometric parameters is given, followed by a very rudimentary review of the implications of the hypothesis put forward by Hyde of a vectorial representation of lighting. The application of photometry to geometrical optics is considered. This is followed by a special section devoted to a number of applications of the principle of luminous flux conservation, a principle of particular use to lighting engineers. A few comments are given on the difficult question of the maximum brilliance obtainable from a secondary source. B.W.

N85-11822# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
BRIGHTNESS COMPARISON OF ELECTROLUMINESCENT VERSUS INCANDESCENT LIGHTING: A PHOTOMETRIC VALIDATION Final Report
M. D. Perry Jun. 1984 32 p
(AD-A145395; AFAMRL-TR-84-036) Avail: NTIS HC A03/MF A01 CSCL 13/1

Previous studies involving the brightness comparison of electroluminescent (EL) versus incandescent (INC) lighting indicated that observers saw the EL light as being brighter than the INC light even when both lights were photometrically identical. The intent of this experiment was to determine if a perceptual process was present that inhibited the direct photometric measurement of EL lighting. Twelve observers were asked to compare a variable EL light with a fixed INC light. Nine different brightness levels of the EL light were tested. Subjects were asked to rate if the test lamp (EL) was higher, lower, or the same as the reference lamp (INC). The results from this study showed no difference between the two types of lighting; this in turn validates the use of photometry to measure EL lighting directly. GRA

N85-11823# Rome Air Development Center, Griffiss AFB, N.Y.
THE EFFECT OF TEMPERATURE ON THE RADIATION INDUCED LOSSES OF LARGE DIAMETER GPS (GERMANIUM PHOSPHOSILICATE) AND GBS CORE OPTICAL FIBERS
J. A. Wall Dec. 1983 19 p
(AF Proj. 2306)
(AD-A145409; RADC-TR-83-288) Avail: NTIS HC A02/MF A01 CSCL 20/6

Large diameter germanium-phosphosilicate (GPS) core and germanium-borosilicate (GBS) core optical fibers were tested for their radiation induced losses under continuous and transient radiation exposures at temperatures of -55 deg C, +25 deg C and +125 deg C. Under continuous irradiation, the GPS core fiber showed a rate of induced loss more than double that of the GBS core fiber at +25 C and a regular increase in induced loss with increasing temperature. The rate of induced loss for the GBS core fiber at +125 C was less than twice that at +25 deg C while at -55 deg C it was more than 20 times the +25 deg C rate. GRA

N85-11824# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EFFECTS OF ATMOSPHERIC WATER VAPOR AND CLOUDS ON NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) AVHRR (ADVANCED VERY HIGH RESOLUTION RADIOMETER) SATELLITE DATA M.S. Thesis
D. J. Knipp Jul. 1984 102 p
(AD-A145425; AFIT/CI/NR-84-55T) Avail: NTIS HC A06/MF A01 CSCL 17/5

The effect of varying amounts of water vapor on the infrared portions of the solar reflected radiances and on earth emitted, far infrared radiances is described. By virtue of several data screening processes, it was possible to determine that the change in atmospheric water content over a several day period was responsible for variations in the satellite derived infrared radiance values. Similar variations were found in the far infrared radiance data. The variation in the near infrared channel is a factor in the variability of the vegetative index. A separate but related conclusion of this study is that view angle effect on the solar reflected near infrared channel introduces a larger variability into the data than was previously thought. GRA

N85-11825# Battelle Columbus Labs., Ohio.
OPTICAL WAVEGUIDE SPATIAL FILTERS Final Report
C. M. Verber, R. P. Kenan, J. R. Busch, and M. Parmenter 31 May 1984 62 p
(Contract F49620-79-C-0044)
(AD-A145674; AFOSR-84-0811TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report deals with the continued development of analog computational devices using planar Ti-indiffused LiNb03 waveguide technology. A previously developed integrated optical spatial light modulator is used to implement a electrical-digital t optical-analog converter. Designs for matrix-vector and matrix-matrix multipliers are developed and detailed characierization of an electrooptic herringbone electrode structure which is used in these devices is presented. Author (GRA)

N85-11826# Lockheed Missiles and Space Co., Sunnyvale, Calif.
TOMOGRAPHIC RECONSTRUCTION OF NEUTRON RADIOGRAPH IMAGES Final Technical Report
S. M. Jaffey and K. Dutta 1984 54 p
(Contract N00014-81-C-2227)
(AD-A145682; LMSC-D966339) Avail: NTIS HC A04/MF A01 CSCL 20/6

An investigation of the application of computer-aided tomography to the problem of nondestructive insepction of industrial components. The work presented here describes the application of tomographic techniques to neutron radiography. A comparison of neutron and X-ray tomography is included. Additionally, the capability for three-dimensional visualization of inspection data, made possible by the use of tomographic methods, is described. GRA

N85-11827# California Univ., Irvine. Dept. of Electrical Engineering.
GUIDED-WAVE OPTIC DEVICES FOR INTEGRATED OPTIC INFORMATION PROCESSING Annual Scientific Report, 30 Jan. 1983 - 30 Jan. 1984
C. S. Tsai 8 Aug. 1984 48 p
(Grant AF-AFOSR-0288-80)
(AD-A145695; AFOSR-84-0772TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

Integrated or Guided-Wave Optics is an emerging technology that has the ultimate potential of integrating miniature optical components such as laser light sources, modulators, switches, deflectors, lenses, prisms, and detectors in a common substrate. The resultant integrated optic circuits and subsystems are expected to have a number of advantages over the conventional bulk optical systems in certain areas of applications. Some of the advantages include smaller size and lighter weight, wider bandwidth, lesser electrical drive power requirement, greater signal accessibility, and integratability. The integrated optic circuits are also expected to possess advantages in stability, reliability, ruggedness, and ultimate cost. It has been recognized for some time that the most immediate applications of integrated optics lie in the areas of wideband multichannel communications and signal processing (for both civilian applications such as fiber optic systems and military hardwares such as sensors and radars). The general objectives of this research program are to study the basic physical mechanisms/phenomenon of new and novel guided-wave devices with application to wideband multichannel optical information processing. The major tasks that have been carried out during this program year include theoretical and experimental research on the following two major topics: (1) Wideband Guided-Wave Acoustooptic Interactions and Devices in GaAs-ZnO composite waveguides, and (2) Planar Guided-Wave Magneto-Optic Bragg Diffraction and Devices in YIG-GGG Waveguides. GRA

N85-11828# Department of the Air Force, Washington, D.C.
SENSOR SYSTEM Patent Application
J. E. Heath, inventor (to Air Force) Filed 30 Sep. 1982 17 p
(AD-D011242; US-Patent-Appl-SN-431866) Avail: NTIS HC A02/MF A01 CSCL 17/5

This document describes an infrared sensor system for use

on satellites comprising dual arrays of mercury cadmium telluride semiconductor elements. One array of conventional photovoltaic detectors is wired in parallel with a novel array of HgCdTe material in which the n-type region of each mesa and the resulting p-n junction is considerably smaller than that utilized in the conventional detector. As the cumulative dose of incident radiation is increased, type conversion in both arrays occurs resulting in degraded performance in the conventional array but an increase in performance caused by the now effective p-n junction area in the novel array. An electronic switching device, coupled with a dosimeter, alternately selects the conventional array or the novel array depending upon the total dose of radiation received. GRA

N85-11829# Department of the Army, Washington, D. C.
PROGRAMMABLE OPTICAL SENSOR Patent Application
D. A. Contini, T. E. Carsten, and R. J. Basta, inventors (to Army) Filed 24 Aug. 1984 17 p
(AD-D011244; US-Patent-Appl-SN-644165) Avail: NTIS HC A02/MF A01 CSCL 17/8

A programmable optical sensor is formed by coupling a proximity focused channel intensifier tube to a silicon target vidicon. The photocathode is gated by a first time programmed voltage and the gain of the microchannel plate is also controlled by a second time programmed voltage. The second voltage is less than 1000 volts permitting the use of solid state circuitry.
Author (GRA)

N85-11830# California Univ., Livermore. Lawrence Livermore Lab.
FORE-OPTICS SYSTEMS DESIGNED FOR ELECTRONIC STREAK CAMERAS USING FIBER OPTICS
R. P. Reedy Jul. 1984 8 p refs Presented at SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984
(Contract W-7405-eng-48)
(DE84-014525; UCRL-90547; CONF-840872-5) Avail: NTIS HC A02/MF A01

The general principles that should be considered in designing a fore-optics system to image signals from optical fibers onto the photocathode of a streak tube are described. Important design considerations of these systems include lens design (resolution, magnification, relative aperture, field size, and transmission), use of supplementary field lenses, and the configuration of the fiber arrays. Provisions made in these systems to evaluate all channels of the complete fiber system and to align the fiber-array images on the photocathode are also discussed. Typical applications of these fore-optics systems include simultaneous filtering of multiple channels of optical signals, reducing the size of the image, or using a streak camera that has a curved front window. DOE

N85-11831# Rome Univ. (Italy). Dipt. di Fisica.
THE BEATRICE EXPERIMENT AND THE LUMINANCE CONCEPT IN DANTE [L'ESPERIENZA DI BEATRICE E IL CONCETTO DI LUNINANZA IN DANTE]
R. Cialdea 18 May 1984 18 p refs In ITALIAN
(Nota-Interna-823) Avail: NTIS HC A02/MF A01

An experiment suggested by Beatrice in Dante's Divine Comedy is analyzed to show that Dante was well aware of the knowledge of his time to the point of exploring concepts not understood in the 13th century. The experiment shows that the luminance of a spherical light source as perceived by the retina, is independent of the source distance. Three mirrors are used in the experimental set-up. Author (ESA)

N85-11722# Joint Publications Research Service, Arlington, Va.
FLUCTUATIONS IN PARAMETERS OF LIGHT BEAM ALONG PATH WITH REFLECTION IN TURBULENT ATMOSPHERE Abstract Only
Yu. I. Kolilevich and G. B. Sochilin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 82 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 2(240), Feb. 1984 p 315-324 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11724# Joint Publications Research Service, Arlington, Va.
FIBER CABLE IN OPTICAL SYSTEM WITH BRIGHTNESS AMPLIFIER Abstract Only
V. S. Aleynikov, F. V. Bunkin, Ye. M. Dianov, K. I. Zemskov, M. A. Kazaryan, G. G. Petrash, A. M. Prokhorov, and V. V. Savranskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 91-92 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1373-1376 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11725# Joint Publications Research Service, Arlington, Va.
NONLINEAR SYMMETRIZATION OF PICOSECOND PULSES IN OPTICAL FIBERS Abstract Only
M. I. Demchuk, V. P. Mikhaylov, A. M. Prokhorov, I. N. Sisakyan, A. B. Shvartsburg, and K. V. Yumashev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 93-94 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 6, 26 Mar. 1984 p 338-341 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11726# Joint Publications Research Service, Arlington, Va.
TRANSFER FUNCTION OF MULTILAYERED MAGNETOOPTICAL SPACE-TIME MODULATOR Abstract Only
M. P. Petrov and V. I. Belotitskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 94 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 115-119 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11743# Joint Publications Research Service, Arlington, Va.
MAGNETOABSORPTION OF WEAK LIGHT WAVE IN PRESENCE OF INTENSE LIGHT WAVE IN SEMICONDUCTOR WITH NARROW FORBIDDEN BAND Abstract Only
B. S. Monozon and A. G. Zeilich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 12 Transl. into ENGLISH from Fiz. i Tekhn. Poluprov. (Leningrad), v. 17, no. 12, Dec. 1983 p 2163-2167 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11748# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF GROWTH OF SURFACE PERIODIC STRUCTURES WHEN INTENSE LIGHT ACTS ON CONDENSED MEDIA Abstract Only
A. M. Bonch-Bruyevich, M. N. Libenson, and V. S. Makin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 22 Transl. into ENGLISH from Pisma v. Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 3-8 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11769# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF VIBRATIONAL SPECTRUM AND SELECTION RULES IN RAMAN AND HYPER-RAMAN LIGHT SCATTERING SPECTRA OF INORGANIC GLASSES Abstract Only
B. G. Varshal, V. N. Denisov, B. N. Mavrin, V. G. Podobedov, and Kh. Ye. Sterin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 68 Transl. into ENGLISH from Fiz. i Khim. Stekla (Leningrad), v. 9, no. 5, Sep. - Oct. 1983 p 513-520 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11770# Joint Publications Research Service, Arlington, Va.
CHECKING OPTICAL-POLARIZATION MEASUREMENTS AT INTERFACES Abstract Only
Yu. I. Vologzhaninov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 69 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 19, no. 8, Aug. 1983 p 53-58 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11773# Joint Publications Research Service, Arlington, Va.
USING FIBER-OPTICS LIGHT GUIDES IN DIAGNOSING INTENSE SHOCK WAVES Abstract Only
V. Ye. Bespalov, M. M. Bubnov, V. I. Voychenko, B. A. Demidov, Ye. M. Dianov, M. V. Ivkin, I. K. Krasyuk, P. P. Pashinin, A. M. Prokhorov, S. M. Nefedov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 83 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 1, 12 Jan. 1984 p 55-60 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11777# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF GEOMETRIC STABILITY OF LASER MIRROR OPTICAL SURFACE Abstract Only
N. A. Bochkov, V. F. Gordeyev, V. S. Kolesov, V. M. Kostin, and A. G. Lanin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 92 Transl. into ENGLISH from Poverkhn.: Fiz., Khim., Mekhan. (Moscow), no. 11, Nov. 1983 p 89-96 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06//MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-11832# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STATISTICAL PLASMA PHYSICS. PROCEEDINGS OF THE WORKSHOP OF THE US-JAPAN JOINT INSTITUTE FOR FUSION THEORY PROGRAM
Jul. 1984 212 p refs Workshop held in Nagoya, Japan, 20-24 Feb. 1984
(IPPJ-689) Avail: NTIS HC A10/MF A01

Statistical physics problems in fusion plasmas was discussed. The topics included: chaos in nonlinear systems; chaos in conservation systems; chaos in dissipative systems; solitions and chaos; and statistical properties of plasmas. For individual titles, see N85-11833 through N85-11853.

N85-11833# GA Technologies, Inc., San Diego, Calif.
BEHAVIOR ORBITS OF TWO COUPLED OSCILLATORS
John M. Greene *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 8-13 ref (For primary document see N85-11832 02-75)
(Contract DE-AT03-84ER-53158)
Avail: NTIS HC A10/MF A01

Progress was made in understanding the structure of two-dimensional area-preserving maps. It is used to understand the essential features of the behavior of two coupled nonlinear oscillators, or any equivalent system. A Poincare map of rho versus theta at integer times, with a number of orbits, is shown. It shows periodic orbits as sets of points, KAM oribts as closed curves, and chaotic orbits as bands. The calculation of boundary KAM curves specifies the choatic bands. It is found that renormalization produces finite procedures which determine the behavior of coupled oscillator systems. E.A.K.

N85-11834# Kagoshima Univ. (Japan). Dept. of Physics.
DIFFUSION AND INTERMITTENCY IN AN EXTENDED ONE-DIMENSIONAL MAPS
H. Fujisaka, M. Inoue, and H. Uchimura *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 14-27 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

A new characteristic exponent approach to stochastic and coherent structures of chaotic systems was presented. It is shown that the chaotic process exhibits two complementary ones, diffusion and intermittency which correspond to stochastic and coherent structures, respectively. Scaling behaviors of characteristic exponents are found by adopting a simple example near its transition points and good agreement with numerical results is obtained. E.A.K.

N85-11835# Nagoya Univ. (Japan). Inst. of Plasma Physics.
LONG TIME CORRELATION AND STOCHASTIC DIFFUSION IN THE STANDARD MAP
Y. H. Ichikawa, T. Kamimura, and T. Hatori *In its* Statist. Plasma Phys. Jul. 1984 p 28-41 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The long time correlation and stochastic diffusion associated with the standard map were studied by numerical observation. Observed temporal evolution of the momentum distribution function is compared with analytic solution of the diffusion equation. It is found that even if the accelerator mode exists, the main part of the momentum distribution function appears to be evolving as the diffusion process. E.A.K.

N85-11836# Queen Mary Coll., London (England). Applied Mathematics.
STOCHASTICITY AND TRANSPORT IN HAMILTONIAN SYSTEMS
R. S. MacKay, J. D. Meiss (Texas Univ., Austin), and I. C. Percival *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 42-54 refs (For primary document see N85-11832 02-75)
(Contract DE-FG05-80ET-53088)
Avail: NTIS HC A10/MF A01

The theory of transport in nonlinear dynamics was developed in terms of leaky barriers which remain when invariant tori are destroyed. A critical exponent for transport times across destroyed tori is obtained which explains numerical results of Chirikov. The combined effects of many destroyed tori lead to power law decay of correlations which are observed in many computations. E.A.K.

N85-11837# Nagoya Univ. (Japan). Inst. of Plasma Physics.
LONG-TIME TAIL IN THE TWO-WAVE MODEL
T. Hatori, Y. Abe, H. Irie (Nihon Univ., Tokyo), and A. N. Kaufman (California Univ., Berkeley) *In its* Statist. Plasma Phys. Jul. 1984 p 55-61 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The velocity time correlation function is found, both theoretically and numerically, to decay with the power law for the chaotic orbit governed by a Hamiltonian, H = v to 2nd power/2 - Mcosx - Pcos [k(x-t)], M, P and k are the parameters. E.A.K.

N85-11838# Princeton Univ., N. J. Plasma Physics Lab.
DESTRUCTION OF MAGNETIC SURFACES IN THREE-DIMENSIONAL MHD EQUILIBRIA
A. H. Reiman and A. H. Boozer *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 62-68 refs (For primary document see N85-11832 02-75)
(Contract DE-AC02-76CHO-3073)
Avail: NTIS HC A10/MF A01

Magnetic island formation in three-dimensional magnetohydrodynamic equilibria is analyzed. The mathematical foundation of this analysis is provided. The analysis is also applied to a heliac device. R.S.F.

N85-11839# Texas Univ., Austin. Inst. for Fusion Studies.
ELIMINATION OF STOCHASTICITY IN STELLARATORS
James D. Hanson and John R. Cary *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 69-78 refs Previously announced as N84-15985 (For primary document see N85-11832 02-75)
(Contract DE-FG05-80ET-53088)
Avail: NTIS HC A10/MF A01

A method for optimizing stellarator vacuum magnetic fields is discussed. Application of this method shows that the stochasticity of vacuum magnetic fields can be made negligible by proper choice of the coil configuration. It is shown that the optimization increases the equilibrium beta limit by factors of two or more over that of the simple, straight coil winding law. The method is general and is applicable to other systems in which stochasticity is a problem, yet is affected by the design parameters. DOE

N85-11840# Maryland Univ., College Park.
N-FREQUENCY QUASIPERIODICITY AND CHAOS IN DISSIPATIVE DYNAMICAL SYSTEMS
Celso Grebogi, Edward Ott, and James A. Yorke *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 79-82 refs Sponsored in part by DOE (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The possibility of N-frequency quasiperiodicity with N > or = 3 being in a typical nonlinear dissipative dynamical system was investigated. The relative occurrence and structure of chaotic attractors on an N-torus are considered. R.S.F.

N85-11841# Kyushu Univ., Fukuoka (Japan). Dept. of Physics.
SHAPE OF POWER SPECTRUM OF INTERMITTENT CHAOS
B. C. So and H. Mori *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 83-95 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

Power spectra of intermittent chaos are calculated analytically. It is found that the power spectrum near onset point consists of a large number of Lorentzian lines with two peaks around frequencies omega = O and omega = omega sub O, where omega sub O is a fundamental frequency of a periodic orbit before the onset point, and furthermore the envelop of lines around omega = O obeys the power law 1/the absolute value of omega squared, whereas the envelope around omega sub O obeys 1/the absolute value of omega minus omega sub O all to the fourth power. The universality of this power law dependence in a certain class of intermittent chaos are clarified from a phenomenological view point. R.S.F.

N85-11842# Tokyo Univ. (Japan). Dept. of Mathematics.
PHASE TRANSITION WHICH EXHIBITS 1/OMEGA-SPECTRUM: A RIGOROUS RESULT
Y. Takahashi *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 96-103 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

A mathematical mechanism in dynamical systems to exhibit the inverse power law in the shape of the power spectrum is presented. The exponent in the power law is proven to be less than or equal to one. The mechanism serves as the basis to interpret various observations in dynamical systems, such as Lorenz and Rossler systems. All the possible exponents are realized by simple one-dimensional maps. These examples are isomorphic to one-dimensional lattice gas models in classical statistical mechanics with phase transition. The inverse powr law appears at the crisis of the shrinking of gas hases into degenerated solid phases, in effect, the divergence of the total mass of absolutely continuous mixing invariant measures for the maps. Author

N85-11843# Tokyo Univ. (Japan). Inst. of Physics.
STOCHASTIC PROPERTY OF K-dV SOLITONS PERTURBED BY RANDOM FORCES
Miki Wadati *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 104-113 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The Korteweg-de Vries equation with a dampin term and an external force term is studied. in the non-damping case, the evolution of soliton solution under Gaussian white noise is explicitly shown. For large t, a height and a width of the soliton are proportional to t(-3/2) and t(3/2) respectively. The damping case is also discussed. An idea for the analysis of the inhomogeneous soliton equation is presented. Author

N85-11844# Tokyo Univ. (Japan). Inst. of Solid State Physics.
CHAOTIC BEHAVIOR INDUCED BY SOLITONS IN PERTURBED INTEGRABLE SYSTEMS Abstract Only
M. Imada *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 114-115 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The effect of spatial inhomogeneities near the onset of chaos is one of the most challenging problem in the exploration of the real turbulence. Spatial dependence has a tendency to inhibit the chaos in some cases in the numerical simulation of the perturbed sine-Gordon equation; however, the opposite tendency for enhancing the chaotic behavior is also observed in the same perturbed sine-Gordon system. In this case, chaotic behavior is generated at the soliton-soliton collision spot, and the orbital instability propagates spatially from the collision spot to other points. In the presence of perturbation, the interaction of solitons becomes inelastic, which induces small amplitude oscillation after the collision. The numerical results show that the small amplitude oscillation is emitted chaotically during the collision. The propagation of the random oscillation causes the unstable and chaotic behavior at any points far from the collision spot. By introducing the spatial dependence, the aspect of the onset of chaos seems to be rich and quite different from the case with few degrees of freedom. Author

N85-11845# California Univ., Berkeley. Dept. of Physics.
HAMILTONIAN AND LAGRANGIAN THEORY OF GYROKINETIC EQUATIONS
Robert G. Littlejohn *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 116-121 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

Notorious for the complexity of the algebra involved in their derivation and application gyrokinetic equations are of great practical importance as a means of describing the low frequency kinetic behavior of plasmas in inhomogeneous magnetic fields. The mathematical structure of these equations is examind for general principles which can help in developing more efficient alorithms for handling them. Derivations of gyrokinetic equations typically take the Vlasov equation in the usual coordinates as given, and then proceed to make various substitutions in order to change the independence variables to a new set. Usually the new set of independent variables is some version of guiding center coordinates. Transforming the time derivatives by the inverse chain rule reduces the problem of transforming the Vlasov equation into one of transforming the single particle equations of motion. Canonical transformations and noncanonical approaches to Hamiltonian theory are reviewed. An approach based on Lagrangians in phase space is outlined and a set of A.R.H.

N85-11846# Nagoya Univ. (Japan). Dept. of Physics.
STABLE DISTRIBUTION AND LEVY PROCESS IN FRACTAL TURBULENCE
Hideki Takayasu *In its* Statist. Plasma Phys. Jul. 1984 p 122-127 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The motion of a small light particle drifting with the fluid element of plasma turbulence is considered. A probability distribution of the particle is obtained which shows that the stochastic process of the motion is the Levy process. The diffusion process of this type is often called anomalous in comparison with ordinary thermal diffusion and the trail of this particle may be fractal with the dimension D/2, that is, intermediate between 1 (the dimension of paths of linear flight) and 2 (that for trails of Brownian motion). The motion of an electron in a uniformly magnetized plasma is also examined. M.G.

N85-11847# Kyushu Univ., Fukuoka (Japan). Coll. of General Education.
THEORY OF PENDEROMOTIVE FORCES
Hachiro Akama *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 128-131 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

A high frequency electromagnetic wave is assumed to be propagating in a uniform, isotropic plasma. A theory of ponderomotive forces based on the Vlasov equation is presented. Different kinds of forces are examined whether they act on resonant particles or on nonresonant particles. A.R.H.

N85-11848# Japan Atomic Energy Research Inst., Ibaraki. Dept. of Thermonuclear Fusion Research.
INTEGRAL OF WAVE KINETIC EQUATION OF DRIFT WAVES

Kimitaka Itoh and Sanae-Inoue Itoh (Hiroshima Univ.) *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 132-139 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The integral of the kinetic equation of electrostatic drift waves is obained based on the weak turbulence approach for arbitrary number of modes, N. If the stationary spectrum of N modes exists, the wave amplitude is bounded for any initial conditions. The stationary spectrum, which appears only if the initial spectrum coinsides with it, is estimated to be the most probable one, if the amplitude of the stationary spectrum is larger. In the presence of the spontaneous emission term, the spectrum relaxes to the stationary spectrum. Author

N85-11849# Tokyo Univ. (Japan). Dept. of Physics.
ION-DENSITY CORRELATIONS AND ENHANCEMENT OF THERMONUCLEAR REACTION RATE IN DENSE, INERTIALLY CONFINED FUSION PLASMAS
Setsuo Ichimaru *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 140-164 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The inter-ionic density correlates and the associated screening potential are investigated for dense, high temperature plasmas with parameters appropriate to the inertially confined fusion experiments and the interior of main-sequence stars. The hypernetted chain scheme is used for the analysis of the correlations, where the screening effect of the electrons is taken into account via the dielectric function with inclusion of partial degeneracy and the local-field correction. Explicit analytic expressions are derived for the enhancement rate of thermonuclear reactions applicable uniformly over the entire parameter domain of plasmas with the ionic charge Z = 1 and 2. M.G.

N85-11850# Okayama Univ. (Japan). Dept. of Electronics.
MANY-BODY CORRELATIONS IN STRONGLY-COUPLED PLASMAS
Hiroo Totsuji *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 165-175 refs Sponsored by Ministry of Education, Science and Culture (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

Two aspects of many-particle correlations of ions in strongly-coupled plasmas are analysed on the basis of numerical experiments. First, the pair correlation function and the structure factor in the polarizing background of lectrons are obtained and electric and thermal conductivities are calculated. Then the triplet correlation of ionsin the uniform background is discussed in comparison with simple closure approximations. Author

N85-11851*# Colorado Univ., Boulder.
STRONG LANGMUIR TURBULENCE
Martin V. Goldman *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 176-190 refs Sponsored by NASA, AFOSR, and NSF (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01 CSCL 20I

Beam-excited Langmuir turbulencé in the solar wind is discussed and the criteria for wave-particle, three-wave and strong turbulence interactions are explained. The results of a numerical integration of the Zakharov equations are presented which describe the strong turbulence saturation of a weak (low-density) high energy, bump-on-tail beam instability. Author

N85-11852# Kyushu Univ., Fukuoka (Japan). Coll. of General Education.
A NEW MASER EFFECT IN PLASMA TURBULENCE
Mitsuhiro Nambu *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 191-197 refs (For primary document see N85-11832 02-75)
Avail: NTIS HC A10/MF A01

The amplification condition of a Langmuir wave in the presence of ion wave turbulence is obtained for the Maxwell distribution function of electrons. The physical mechanism responsible for the plasma maser theory is clarified based on high frequency nonlinear forces. Author

N85-11853# GA Technologies, Inc., San Diego, Calif.
A SIMPLE TRANSPORT MODEL
John M. Greene *In* Nagoya Univ. Statist. Plasma Phys. Jul. 1984 p 198-201 refs (For primary document see N85-11832 02-75)
(Contract DE-AT03-84ER-53158)
Avail: NTIS HC A10/MF A01

The problem of transport in Hamiltonian systems is addressed and a model is formulated that contains space in discrete units as an element. An infinite sequence of boxes is used, the areas of which are finite and decrease geometrically. A given orbit moves from box to neighboring box stochastically. To imitate a canonical distribution in sparse space, the equilibrium has the number of orbits per box equal to the area of the box. The boundary condition that the first box is a perfect absorber is set. The initial distribution is given and the time development is calculated. The equilibrium distribution is uniform in area weighing. The long time decay of a distribution is almost certainly polynomial in time. The nature of large n boxes makes the orbits sticky. This kind of behavior is nonGaussian. Elements of the model are identified with the calculation of MacKay, Meiss, and Percival. It is assumed that the convergence of the box areas at finite n corresponds to approach to the last KAM surface at an island edge. A.R.H.

N85-11854# Language Services, Knoxville, Tenn.
RELAXATION OF PLASMA ROTATION IN A TOKAMAK IN THE PRESENCE OF EXTRANEOUS FORCES AND CORRUGATION OF THE MAGNETIC FIELD
A. B. Mikhailovskii, V. S. Tsypin, and I. V. Kurchatov 16 Aug. 1984 20 p refs Transl. into ENGLISH of Preprint no. IAE-3791/6 I. V. Kurchatov Atomic Energy Inst., Sukhumi Physico-Technical Inst., Moscow, 1983 24 p
(DE84-015628; ORNL-tr-5143; IAE-3791/6) Avail: NTIS HC A02/MF A01

The relaxation of plasma rotation in a Tokamak in the presence of extraneous forces and corrugation of the magnetic field is investigated. The poloidal and toroidal plasma velocities that are established as a result of the competition of extraneous forces and longitudinal viscosity are calculated. Under reactor/Tokamak conditions, the poloidal plasma velocity in the presence of extraneous forces remains the level of the drift velocity The toroidal velocity in a corrugated Tokamak with longitudinal injection of fast neutrals is assessed and demonstrated that even with a slight corrugation it is small in comparison with the thermal velocity of the ions. DOE

N85-11855# Naval Postgraduate School, Monterey, Calif.
CERENKOV RADIATION IN THE NEIGHBORHOOD OF THE EMISSION THRESHOLD, REVISED
F. R. Buskirk and J. R. Neighbours Aug. 1984 9 p Supersedes report dated May 1984, AD-A143088
(AD-A145458; NPS61-84-007-Rev) Avail: NTIS HC A02/MF A01 CSCL 20/9

Cerenkov radiation for constant velocity electrons in an infinite uniform dielectric has a sharp threshold for v (electron) larger than the speed of light in the dielectric. A medium of finite length produces diffraction which smears the Cerenkov emission angle and lowers the threshold velocity for emission. GRA

N85-11856# Naval Research Lab., Washington, D. C.
IMPLODING PLASMA RADIATION SOURCES: BASIC CONCEPTS
J. Guillory and J. Davis 31 Jul. 1984 63 p
(DNA Proj. T99-QAXL)
(AD-A145542; AD-E000592; NRL-MR-5392) Avail: NTIS HC A04/MF A01 CSCL 20/9

This document is prepared as a briefing aid and technical primer for persons unfamiliar and uninitiated with the theory of imploding plasma radiation sources. It is hoped that it will prove helpful in introducing the basic physics concepts of these sources

and in presenting these concepts to newcomers and potential users. GRA

N85-11857# Michigan Univ., Ann Arbor. Particle Beam Research Lab.
NEUTRAL BEAM INTERACTIONS WITH MATERIALS Annual Report, 1 Jun. 1983 - 31 May 1984
R. S. Ong, J. J. Duderstadt, and R. M. Gilgenbach Jun. 1984 62 p
(Grant AF-AFOSR-0029-80)
(AD-A145636; AFOSR-84-0690TR) Avail: NTIS HC A04/MF A01 CSCL 20/9

A duopigatron has been used to accelerate ion and neutral beams of hydrogen, argon krypton, and xenon. An important class of ion source plasma instabilities has been investigated. The frequency of source plasma oscillations scale as the square root of ion mass. Ion extraction efficiencies for the various mass species show excellent agreement with theory in the transition from the space charge limited regime to the ion saturation regime. Displaced aperture grids with geometic focusing have been studied. Ruby laser ablation plasma experiments are underway and the ablation plasma parameters have been measured. Theoretical research has been directed towards developing analytic expressions for neutral beam stopping in solid matter in order to compare with ion beam stopping. A second part of the theoretical effort concerns coupling of three computational physics models to simulate the interaction between a neutral/ion beam with a target ablation plasma. GRA

N85-11858# California Univ., Berkeley. Lawrence Berkeley Lab.
LIE-TRANSFORMATION ACTION PRINCIPLE FOR CLASSICAL PLASMA DYNAMICS
A. N. Kaufman Jun. 1984 6 p refs Presented at Intern. Colloq. on Group Theoretical Methods in Phys., College Park, Md., 21 May 1984
(Contract DE-AC03-76SF-00098)
(DE84-014576; LBL-17976; CONF-8405168-2) Avail: NTIS HC A02/MF A01

The Lie transform for a single particle in a wave is embedded in a Lagrangian action principle for self-consistent plasma dynamics. Variation of the action then yields the Vlasov equation for the oscillation-center distribution, the ray equations and amplitude transport for wave, and the Poisson equation for the quasistatic field. DOE

N85-11859# Los Alamos Scientific Lab., N. Mex.
ELECTRIC FIELD AND PLASMA ENERGIZATION IN COMPUTER SIMULATIONS OF MAGNETOTAIL RECONNECTION
J. Birn 1984 31 p refs Presented at 25th Plenary Session of COSPAR, Graz, 25 Jun. 1984
(Contract W-7405-eng-36)
(DE84-014023; LA-UR-84-2014; CONF-8406167-1) Avail: NTIS HC A03/MF A01

Reconnection in the magnetotail involves structural changes on large spatial and time scales which can, at least up to the present time, be handled only by MHD theory including some kind of resistivity. Numerical MHD simulations of reconnection are able to produce directly results on plasma energization in the form of bulk flow and heating, whereas information on acceleration of selected prticles to higher energies can be obtained only in a secondary way by calculating single particle orbits in the self-consistent time dependent magnetic and electric fields following from the MHD simulation. Results from numerical MHD codes on bulk and single particle energization and the electric fields governing possible energization are reviewed and discussed. DOE

N85-11860# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
PLASMA DRIFT TOWARDS A PLANE EQUIPOTENTIAL SURFACE
P. Carlqvist Mar. 1984 25 p ref
(TRITA-EPP-84-01; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

Collisionless plasma models are used to show that when the plasma comes sufficiently close to a plane equipotential surface (conducting plate) it is deflected along the surface. The deflection is not caused by pressure effects but by the electric and magnetic fields. Small fluxes of ions and electrons also cross the plane equipotential surface. These fluxes account for an electric current in the plasma which induces a magnetic field in the same direction as the total magnetic field assumed to be homogeneous. It is shown that if the Alfven number (MA) is much smaller than unity in the volume considered, the magnetic field induced by plasma currents is small compared to the total magnetic field. If MA is of the order of unity or larger, the total magnetic field is substantially generated by plasma currents. Author (ESA)

N85-11720# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYDROGEN ON FORMATION OF ENERGY SPECTRUM OF MULTIPLY CHARGED AND COPPER IONS Abstract Only
M. R. Bedilov and M. S. Sabitov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 79 Transl. into ENGLISH from Izv. Akad. Nauk Ucheb. Zaved. SSR: Ser. Fiz.-Mat. Nauk (Tashkent, USSR), no. 1, Jan. - Feb. 1984 p 55-57 Original language doc. previously announced in IAA as A84-11363 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11729# Joint Publications Research Service, Arlington, Va.
SCATTERING OF ELECTROMAGNETIC WAVES BY PLASMA HALF-SPACE AFTER INITIATION OF MOTION Abstract Only
A. G. Nerukh *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 106 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 2, Feb. 1984 p 216-226 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11730# Joint Publications Research Service, Arlington, Va.
BREMSSTRAHLUNG RADIATION FROM LONGITUDINAL PLASMA WAVES CAUSED BY SUBTHERMAL ELECTRONS IN PLASMA Abstract Only
A. V. Akopyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 108-109 Transl. into ENGLISH from Izv. Akad. Nauk Armyansk. SSR: Fiz. (Yerevan), v. 19, no. 1, Jan. - Feb. 1984 p 15-19 Previously announced as N84-32102 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11767# Joint Publications Research Service, Arlington, Va.
RANDOM PROCESSES AND MAGNETOHYDRODYNAMIC TURBULENCE Abstract Only
A. G. Bershadskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 60 Transl. into ENGLISH from Magnitn. Gidrodinam. (Riga), no. 4, Oct. - Dec. 1983 p 87-93 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11768# Joint Publications Research Service, Arlington, Va.
MEASURING LOCAL ION ENERGY DISTRIBUTION FUNCTION IN TUMAN-3 TOKAMAK PLASMA Abstract Only
A. V. Grigoryev, A. N. Zinovyev, A. I. Kislyakov, A. A. Korotkov, Ye. R. Krzhizhanoskiy, Yu. V. Maydl, K. G. Shakhovets, and S. G. Shchemelinin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 64 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 2, 26 Jan. 1984 p 76-80 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-11861*# University of Southern California, Los Angeles. Dept. of Materials Science.

HIGH TEMPERATURE DEFORMATION OF HOT-PRESSED POLYCRYSTALLINE ORTHOENSTATITE Ph.D. Thesis
Abolghasem Dehghan-Banadaki Feb. 1983 147 p refs
(Grant NAGw-43)
(NASA-CR-174026; NAS 1.26:174026) Avail: NTIS HC A08/MF A01 CSCL 20B

Artificial hot pressed polycrystalline samples were prepared from purified powder of Bamble, Norway, orthoenstatite, (M90.86Fe 0.14)SiO3. The uniaxial creep behavior of the polycrystalline orthoenstatite was studied over stress ranges of 10-180 MPa and temperatures of 1500-1700 K (0.82-0.93 T sub m) under two different oxygen fugacities, namely equilibrium (Mo-MoO2 buffer) and a reducing (graphite heating element) atmosphere, respectively. An intergranular glassy phase of different compositions with a cavitational creep deformation were observed. In the Mo-MoO2 buffer atmosphere with PO2 approx. 10 to the minus 11 power - 10 to the minus 13 power atmospheres, the results of an analytical electron microscopy analysis indicate that the glassy phases are richer in Ca and Al due to the residual impurities after hot pressing. In the reducing atmosphere with an oxygen fugacity of PO2 approx. 10 to the minus 3 power - 10 to the minus 25 power atmospheres, the results of analytical electron microscopy analysis indicate that the glassy phase is almost pure silica with the presence of free iron precipitate on grain facets and at triple junctions due to the reduction of bulk materials. B.W.

N85-11862*# Connecticut Univ., Storrs. Dept. of Mechanical Engineering.
BIAXIAL CONSTITUTIVE EQUATION DEVELOPMENT FOR SINGLE CRYSTALS Semiannual Status Report, 6 Jan. - 6 Jul. 1984
Eric H. Jordan 1984 29 p
(Grant NAG3-512)
(NASA-CR-174056; NAS 1.26:174056) Avail: NTIS HC A03/MF A01 CSCL 20L

Current gas turbine engines utilize large single crystal superalloy components in the hot section. Structural analysis of these components requires a valid stress strain temperature constitutive equation. The goal of the program described is to create one or more models and verify these models. A constitutive equation based on an assumed slip behavior of a single slip system was formulated, programmed, and debugged. Specifically, the basic theory for a model based on aggravating slip behavior on individual slip systems was formulated and programmed and some simulations were run using assumed values of constants. In addition, a formulation allowing strain controlled simulations was completed. An approach to structural analysis of the specimen was developed. This approach uses long tube consistancy conditions and finite elements specially formulated to take advantage of the symmetry of 100 oriented specimens. R.S.F.

N85-11863# Army Materials and Mechanics Research Center, Watertown, Mass.
PROCEEDINGS OF THE ION IMPLANTATION FOR ARMY NEEDS WORKSHOP Final Report
Jun. 1984 184 p Workshop held at Watertown, Mass., 30-31 Jul. 1981
(AD-A145474; AMMRC-MS-84-1) Avail: NTIS HC A09/MF A01 CSCL 20/8

This document contains papers and discussion included in a Workshop on ion implantation held at the Army Materials and Mechanics Research Center, Watertown, MA, are presented. The various sessions contain introductory remarks, fundamentals, current practice, research and development, corrosion studies, and summary review for planning base. For individual titles, see N85-11864 through N85-11870. GRA

N85-11864# Cornell Univ., Ithaca, N.Y.
MATERIALS MODIFICATION BY ION BEAM MIXING
J. Mayer *In* Army Materials and Mechanics Research Center Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 7-20 (For primary document see N85-11863 02-76)
(AD-P003948) Avail: NTIS HC A09/MF A01 CSCL 20/8

This paper presents a general overview discussion of materials modification by ion beam mixing. This technique consists of depositing a thin film on a substrate and then using a beam of inert ions to mix up this area. GRA

N85-11865# Army Electronics Technology and Devices Lab., Fort Monmouth, N. J. Electronics Technology/Devices Lab.
CHARACTERISTICS OF ION IMPLANTERS FOR FABRICATION OF ELECTRONIC DEVICES
A. Mark *In* Army Materials and Mechanics Research Center Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 23-33 (For primary document see N85-11863 02-76)
(AD-P003949) Avail: NTIS HC A09/MF A01 CSCL 20/8

This paper concerns the characteristics of ion implanters for fabrication of electronic devices. High voltage implanters have been designed for implanting ions deeper into semiconductor materials. They are now standardized at 400 keV. GRA

N85-11866# Army Materials and Mechanics Research Center, Watertown, Mass.
REVIEW OF THE UNIVERSITY OF MANCHESTER ION IMPLANTATION CONFERENCE
P. Sagalyn *In its* Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 35-50 (For primary document see N85-11863 02-76)
(AD-P003950) Avail: NTIS HC A09/MF A01 CSCL 20/8

This paper presents some highlights of a conference on ion implantation held at the University of Manchester. Some emphasis is put upon the use of ion implantation for materials other than semiconductors. GRA

N85-11867# Army Research Office, Research Triangle Park, N. C.
RESEARCH AND DEVELOPMENT REQUIREMENTS FOR ION IMPLANTATION
P. Parrish *In* Army Materials and Mechanics Research Center Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 53-62 (For primary document see N85-11863 02-76)
(AD-P003951) Avail: NTIS HC A09/MF A01 CSCL 20/8

This paper, on the research and development requirements for ion implantation, stresses the potential applications for corrosion reduction and conservation of critical materials. GRA

N85-11868# Naval Research Lab., Washington, D. C.
NAVY PROGRAMS ON ION IMPLANTATION FOR MATERIALS MODIFICATION
J. K. Hirvonen *In* Army Materials and Mechanics Research Center Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 63-93 (For primary document see N85-11863 02-76)
(AD-P003952) Avail: NTIS HC A09/MF A01 CSCL 20/8

The Naval Research Laboratory's involvement in ion implantation is described. Some of the applications emphasized have been wear, bearings and drills. GRA

N85-11869# Bureau of Mines, Avondale, Md.
USE OF ION IMPLANTATION TO MODIFY THE CORROSION BEHAVIOR OF METALS
B. Sartwell *In* Army Materials and Mechanics Research Center Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 107-126 (For primary document see N85-11863 02-76)
(AD-P003953) Avail: NTIS HC A09/MF A01 CSCL 20/8

This paper contains a short review of the Bureau of Mines Corrosion Research Program, in which ion implantation is being studied in connection with the conservation of critical imported materials and the substitution of more abundant domestic materials for imports. GRA

N85-11870# State Univ. of New York, Stony Brook.
THE MODIFICATION OF METALLIC CORROSION BY ION IMPLANTATION: ENGINEERING APPLICATIONS AND FUNDAMENTALS STUDIES

C. R. Clayton *In* Army Materials and Mechanics Research Center Proc. of the Ion Implantation for Army Needs Workshop Jun. 1984 p 127-152 (For primary document see N85-11863 02-76)
(AD-P003954) Avail: NTIS HC A09/MF A01 CSCL 20/8

Studies of ion implantation as a means of modifying the corrosion behavior of alloys should be backed up by fundamental studies which characterize the surface alloys formed. The polarization experiments performed in this work were designed to provide a description of the nature and kinetics of anodic and cathodic reactions which constitute corrosion. GRA

N85-11871# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ELECTRON TRAPS IN THE GaAs PERMEABLE BASE TRANSISTOR M.S. Thesis
J. L. Rienstra Jun. 1984 55 p
(AD-A145399; AFIT/CI/NR-84-41T) Avail: NTIS HC A04/MF A01 CSCL 20/12

An experimental study of deep level traps in the GaAs permeable base transistor (PBT) was carried out using current deep level transient spectroscopy (DLTS). This type of measurement was used because of its ability to detect electron traps in the base region of the PBT, the region most critical to device performance. The automated measurement system was able to capture the PBT current transients and store them for later analysis. With this system, the DLTS signal could be obtained for several rate windows with one thermal scan. The results of the DLTS measurements indicated a number of different deep level traps in the devices tested. The PBT devices tested were each fabricated in slightly different ways, and the differences in the traps detected were understandable. The forward voltage pulse used to fill the deep level traps was relatively high, and hole traps were observed as well as electron traps. One hole trap which was common to three of the devices is thought to be related to the presence of copper in the GaAs around the base. Another hole trap found in one of the devices is thought to be due to iron. GRA

N85-11872# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE BEHAVIOR OF Pb(1-x)Sn(x)Te SEMICONDUCTOR LASER DIODES IN A MAGNETIC FIELD M.S. Thesis
G. L. Lorenzen May 1984 104 p
(AD-A145431; AFIT/CI/NR-84-42T) Avail: NTIS HC A06/MF A01 CSCL 20/12

This thesis examines the magnetic field behavior of semiconductor laser diodes with Pb(1-x)Sn(x)Te active regions for x values of 0, .14, and .16. Most of the data was taken at temperatures less than 17 K with some data taken around 80 K. The diodes were stripe-mesa diodes with stripe widths from 16 micron to 25 micron and cavity lengths from 317 micron to 355 micron. The four diodes examined included a homojunction, a double heterostructure, a 300 quantum well and a 600 A quantum well laser diode. The frequency at zero magnetic field was plotted as a function of diode current. The average mode separations for the Pb(.84)Sn(.16)Te homojunction laser were 1.77 per cm and 11.44 per cm. For the PbTe 300 A quantum well laser at 11 K they were 4.92 per cm and 12.50 per cm. GRA

N85-11873# Naval Research Lab., Washington, D. C.
THE USE OF ION IMPLANTATION FOR MATERIALS PROCESSING Annual Progress Report, 1 Oct. 1982 - 30 Sep. 1983
F. A. Smidt 23 Aug. 1984 189 p
(WR3-0827; RR0-2206)
(AD-A145438; NRL-MR-5393) Avail: NTIS HC A09/MF A01 CSCL 20/8

An interdisciplinary program on the use of ion implantation for materials processing is being conducted at NRL. This report describes the important factors in ion implantation science and technology and reports progress in the use of ion implantation to modify friction, wear, fatigue, corrosion, optical and magnetic properties of materials. Author (GRA)

N85-11874# Paris VI Univ. (France). Lab. d'Optique des Solides.
RELATIONSHIPS BETWEEN ELECTRONIC STRUCTURE AND STABILITY OF METALLIC GLASSES Final Scientific Report, 1 Jan. - 31 Dec. 1983
F. Abeles, M. L. Theye, and V. NguyenVan Jun. 1984 41 p
(Grant AF-AFOSR-0060-83)
(AD-A145506; AFOSR-84-0705TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

Amorphous MgZn alloys have been obtained in the form of thin films by co-evaporation under ultra-high vacuum on cold sapphire substrates (= approx. 10K), for Zn concentrations between 25 and 35 at.%. These films crystallize at about 350K. Their d.c. electrical resistivity and their optical properties between 0.6 and 4 eV have been investigated in situ. The resistivity versus temperature behaviour is roughly similar to that reported for quenched bulk alloys but the resistivity values are significantly larger. The complex dielectric constant follows the free-electron Drude model at low energies up to 1.8 eV. The optical free electron parameters are discussed and compared to those obtained on other free-electron-like amorphous alloys. Special attention is paid to the average effective number of conduction electrons per atom, which is found to be smaller than expected. Author (GRA)

N85-11875# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Electrical Engineering.
CURRENT CONTROLLED LPE (LIQUID PHASE EPITAXY) GROWTH OF SEMICONDUCTORS Final Report, 1 Aug. 1980 - 31 Dec. 1983
E. K. Stefanakos, A. Abul-Fadl, W. J. Collis, and S. Iyer Wright-Patterson AFB, Ohio AFWAL Apr. 1984 58 p
(Contract F33615-80-K-5123)
(AD-A145536; AFWAL-TR-83-4147) Avail: NTIS HC A04/MF A01 CSCL 20/12

The primary objective of this study was to determine the optimum growth parameters for preparing uniform epitaxial crystalline layers of InAs, InSb, InAsSb and Si using the current controlled liquid phase epitaxy (CCLPE) technique. The original objective was later altered and the effort concentrated on the growth of InAs and Si by CCLPE. Author (GRA)

N85-11876# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
INTRAMOLECULAR ELECTRON TRANSFER AT METAL SURFACES. 4: DEPENDENCE OF TUNNELING PROBABILITY UPON DONOR-ACCEPTOR SEPARATION DISTANCE
T. T. T. Li and M. J. Weaver Sep. 1984 11 p
(Contract N00014-79-C-0670)
(AD-A145611; TR-37) Avail: NTIS HC A02/MF A01 CSCL 20/8

Unimolecular electron-transfer rate constants, k sub et, are reported for the one-electron reduction of pentaaminecobalt (III) attached to gold and mercury electrodes via thioalkylcarboxylate ligands containing varying numbers, n, of alkyl carbons. While similar values of k sub et were found at mercury for each reaction, for close-packed monolayers at gold the k sub et values decreased by circa 10 to the 4th power as an increased from one to five. This effect is identified with increasingly nonadiabatic pathways as an increases, a linear plot of log k sub et versus n being obtained. The results provide estimates of the electronic transmission coefficient as a function of the surface-Co(III) separation distance. GRA

N85-11877# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
OPTICAL CONSTANT DETERMINATION OF THIN POLYMER FILMS IN THE INFRARED
R. T. Graf, J. L. Koenig, and H. Ishida 24 Aug. 1984 31 p
(Contract N00014-80-C-0533)
(AD-A145669; CWRU/DMS/TR-13) Avail: NTIS HC A03/MF A01 CSCL 20/6

Thin films of poly(vinyl chloride), poly(methyl methacrylate), and poly(styrene) were analyzed by Fourier transform infrared spectroscopy. The interference fringes present in the transmission spectra of these samples were used to determine thickness and average refractive index (in non-absorbing regions). Subsequent Kramers-Kronig analysis of these transmission spectra provided

the the dispersion of the refractive index and the absorptive index across the entire mid-infrared region. The refractive index and the absorptive index, collectively known as the optical constants, are intrinsic properties of a material, and their spectra are invariant with respect to the geometry and/or thickness of a sample. The intrinsic nature of the derived optical constants was verified by the absence of interference fringes in the optical constant spectra, and by the good agreement obtained between our optical constant spectra and those of other authors. Author (GRA)

N85-11878# United Technologies Research Center, East Hartford, Conn.
PLASTIC STRAIN LOCALIZATION IN SUPERALLOY SINGLE CRYSTALS Annual Report, 1 May 1983 - 30 Apr. 1984
D. L. Anton and A. F. Giamei 31 May 1984 36 p
(Contract F49620-83-C-0104)
(AD-A145705; UTRC/R84-916534-1; AFOSR-84-0775TR) Avail: NTIS HC A03/MF A01 CSCL 20/11

Single crystals of a model Ni-base superalloy were heat treated so as to obtain two different gamma prime distributions; solutioned and quenched and fully aged. Surface replicas of slip occurring after small amounts of plastic deformation were analyzed using TEM techniques as a function of crystal orientation. Slip bands were clearly composed of a large number of fine slip lines. These slip lines were spaced approximately 50 nm apart. A model which describes the mechanism by which these slip lines spread and form slip bands is proposed and substantiated with TEM thin foil micrographs of the deformed alloy. Author (GRA)

N85-11879# Sandia Labs., Albuquerque, N. Mex.
CHARACTERIZATION OF ION IMPLANTED DEUTERIUM TRAPS IN NICKEL BY EQUILIBRATION WITH DEUTERIUM GAS
W. R. Wampler and S. M. Myers 1984 17 p refs Presented at Ion Beam Modification of Mater. Conf., Ithaca, N.Y., 16 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-014958; SAND-84-0490C; CONF-840760-1) Avail: NTIS HC A02/MF A01

Deuterium traps produced in nickel by ion implantation of helium were characterized using a new experimental approach in which the deuterium is introduced by equilibration with deuterium gas. A differentially pumped target chamber allows the amount of trapped deuterium to be monitored by nuclear reaction analysis during the equilibration. Measurements were made for various temperatures and gas pressures spanning a range of trap occupation from nearly empty to nearly full. Trapping was found to be consistent with the presence of two types of traps with respective binding enthalpies of 0.52 eV and 0.43 eV. The number of traps and their binding enthalpies determined here are in good agreement with the values obtained in earlier studies using dynamic release methods. The number of traps was not changed by annealing at 200(0)C, consistent with the identification of the two types of traps as helium bubbles and vacancy clusters. DOE

N85-11880# Los Alamos Scientific Lab., N. Mex.
INTERNAL FRICTION, MICROSTRUCTURE AND RADIATION EFFECTS
M. S. Wechsler, W. F. Sommer, and D. R. Davidson 1984 8 p refs Presented at the 5th Riso Intern. Symp. on Met. and Mater. Sci., Riso, Denmark, 1 Sep. 1984
(Contract W-7405-eng-36)
(DE84-013905; LA-UR-84-1891; CONF-8409103-1) Avail: NTIS HC A02/MF A01

A brief review is given of internal friction relaxation peaks and background internal friction. The microstructural origin of the internal friction is discussed. Particular emphasis is placed on radiation effects. DOE

N85-11881# Michigan Univ., Ann Arbor. Dept. of Physics.
LOW TEMPERATURE PROPERTIES OF Mo/MI SUPERLATTICES
C. Uher, R. Clarke, G. G. Zheng (Argonne National Lab., Ill.), and I. Schuller (Argonne National Lab., Ill.) Jul. 1984 5 p refs Submitted for publication
(Contract W-31-109-eng-38)
(DE84-014729; DOE/NBM-4014729) Avail: NTIS HC A02/MF A01

Results of a combined study of the structural and electronic properties of Mo/Ni superlattices grown by the sequential sputtering technique are pesented. The experiments focused on the region of short modulation wavelength (14 A<lambda<40 A) where strong departures from normal bulk properties may be expected. These are most clearly seen in the competition between magnetic (Ni) and superconducting (Mo) behavior, and in the occurrence of localization effects at low temperatures. Although the samples show a surprisingly high degree of stacking coherence normal to the layers there is an intrinsic interfacial mismatch in these mixed bcc-fcc microstructures which is crucial to understanding their electrical properties. DOE

N85-11882# Oak Ridge National Lab., Tenn. Solid State Div.
OPTIMIZED CONDITIONS FOR THE FORMATION OF BURIED INSULATING LAYERS IN Si BY HIGH DOSE IMPLANTATION OF OXYGEN
O. W. Holland, D. Fathy, J. Narayan, T. P. Sjoreen, and S. R. Wilson (Motorola Inc.) Jul. 1984 15 p refs Presented at the Effects of Modes of Formation on the Struct. of Glass Meeting, Nashville, 9 Jul. 1984 Submitted for publication
(Contract DE-AC05-84OR-21400)
(DE84-015369; CONF-840768-2) Avail: NTIS HC A02/MF A01

Results are presented detailing the dependence of the residual damage on substrate temperature and dose for high dose implantation of oxygen in Si. It was previously demonstrated that a buried oxide layer can be formed by this method. However, the usefulness of this silicon on insulator (SOI) structure has been limited by the considerable damage which accumulates in the crystal overlayer during irradiation. Much of the damage remains even after high temperature annealing. It is shown that the quality of the crystalline layer depends critically on the implant conditions. The preservation of the crystal quality of this layer by implanting at high temperatures to prevent defect clustering competes with the adverse effects caused by rapid diffusion of oxygen into this region. This leads to a rather narrow range of temperature over which optimization occurs. Rutherford backscattering/channeling spectroscopy and cross-sectional, transmission electron microscopy were used for analyzing the samples and for understanding the phenomena of formation of buried insulating layers. DOE

N85-11883# Argonne National Lab., Ill.
APPLICATION OF POSITRON ANNIHILATION IN MATERIALS SCIENCE
R. W. Siegel, M. J. Fluss, and L. C. Smedskjaer May 1984 22 p refs Presented at the 5th Riso Intern. Symp. on Met. and Mater. Sci., Microstruct. Characterization of Mater. by Non-Microscop. Tech., Roskilde, Denmark, 3-7 Sep. 1984
(Contract W-31-109-eng-38)
(DE84-014733; CONF-8409103-2) Avail: NTIS HC A02/MF A01

Owing to the ability of the positron to annihilate from a variety of defect-trapped states, positron annihilation spectroscopy (PAS) has been applied increasingly to the characterization and study of defects in materials in recent years. In metals particularly, it has been demonstrated that PAS can yield defect-specific information which, by itself or in conjunction with more traditional experimental techniques, has already made a significant impact upon the determination of atomic-defect properties and the monitoring and characterization of vacancy-like microstructure development, as occurs during post-irradiation annealing. The applications of PAS are now actively expanding to the study of more complex defect-related phenomena in irradiated or deformed metals and alloys, phase transformations and structural disorder, surfaces and near-surface defect characterization. A number of these applications in materials science are reviewed and discussed with respect to profitable future directions. DOE

N85-11884# California Univ., Davis. Div. of Materials Science and Engineering.
AN INVESTIGATION OF THE ROLE OF SINTERING IN GAS-

SOLID INTERACTIONS Progress Report
Z. A. Munir May 1984 24 p
(Contract DE-AT03-80ER-10708)
(DE84-015481; DOE/ER-10708/T3) Avail: NTIS HC A02/MF A01

The influence of decomposition parameters (temperature and environment) of CdCO3 on the crystallite size of the product (CDO) was investigated. A series of experiments was performed to determine the role of sintering in the oxidation-reduction of iron oxides. DOE

N85-11885# Sandia Labs., Albuquerque, N. Mex.
CHARACTERIZATION OF AMORPHOUS SURFACE LAYERS IN Fe IMPLANTED WITH Ti AND C
J. A. Knapp, D. M. Follstaedt, and B. L. Doyle 1984 17 p refs Presented at the Ion Beam Modification of Mater. Conf., Ithaca, N.Y., 16 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-014960; SAND-84-0464C; CONF-840760-4) Avail: NTIS HC A02/MF A01

The amorphous layers produced when Ti alone or Ti and C are implanted into high purity Fe were characterized by ion beam analyses and TEM. Ion amorphous layer thickness, while TEM was used to characterize the implanted alloy's microstructure. The C and Ti profiles were directly measured by 6 MeV He backscattering. The C profile analysis took advantage of a highly non-Rutherford (alpha, alpha) scattering cross section at high energy. For implanted concentrations less than or equal to 20 at. % Ti, both Ti and C are required to produce the amorphous phase. Lower limits on the Ti and C concentrations needed for amorphization were determined; e.g., with 20 at. % Ti, 4 + or - 2 at. % C is required. Ion implanted C was found to be as effective as C which is incorporated into the sample during Ti implantation in forming the amorphous phase. This result shows how C implantation can be used to form a thicker amorphous layer on Ti implanted steels in order to extend reductions in friction and wear to more severe wear regimes. DOE

N85-11886# Ames Lab., Iowa.
THEORY OF THE DOUBLE CRITICAL STATE IN TYPE-2 SUPERCONDUCTORS
John R. Clem and Antonio Perez-Gonzalez (Iowa State Univ.) 1984 2 p refs Presented at the Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15-22 Aug. 1984 Submitted for publication
(Contract W-7405-eng-82)
(DE84-015461; IS-M-497; CONF-840842-25) Avail: NTIS HC A02/MF A01

A double critical state theory is described by which hysteretic states of a type II superconductor in an applied magnetic field that varies in both magnitude and direction can be calculated. Solutions of the double critical state model are presented for a hysteretic type II superconducting slab subjected to a parallel applied magnetic field that is constant in magnitude but varying in direction. DOE

N85-11887# Rome Univ. (Italy). Ist. di Fisica.
BOUNDARY CONDITION EFFECTS IN THE ENERGY LOSS SPECTRUM OF LAYERED SYSTEMS
S. Nannarone, C. Rinaldi, and L. Sorba 18 Apr. 1983 30 p refs Prepared in cooperation with CNR, Rome
(Nota-Interna-802) Avail: NTIS HC A03/MF A01

A method to calculate the electron energy loss (EEL) spectrum of a general layered system such as an interface is given. It is based on the concept of effective dielectric constant. Examples for model systems are given. The method is applied to the experimental EEL spectra of Ag-Si and those of the oxidation of silicon. Interpretation of the loss spectra taken at different primary beam energy, and plasma loss intensities associated with a core level peak in photoemission or Auger spectroscopy are discussed. Author (ESA)

N85-11888# Rome Univ. (Italy). Ist. di Fisica.
ELECTRON ENERGY LOSS INVESTIGATION OF THE ELECTRONIC AND STRUCTURAL PROPERTIES OF PALLADIUM
G. Chiarello (Calabria Univ., Italy), E. Colavita (Calabria Univ., Italy), M. DeCrescenzi (Calabria Univ., Italy), and S. Nannarone 12 May 1983 43 p refs
(Nota-Interna-803) Avail: NTIS HC A03/MF A01

The versatility of electron energy loss spectroscopy for investigating the electronic and structural properties of a bulk sample is shown. The technique can be used for ranging from low to high energies in the same experimental apparatus. The electronic properties of palladium are interpreted within band structure framework and confirmed through investigation of adjacent transition metals. The structural properties are presented as radial distribution functions. The extended X-ray absorption fine structure like oscillations detected above the N2,3 and M4,5 core levels of Pd provide very similar results supporting the signal interpretation scheme of the high loss energy range. Author (ESA)

N85-11889# Rome Univ. (Italy). Ist. di Fisica.
REFLECTION ELECTRON ENERGY LOSS INVESTIGATION OF THE H-GaAs(110) SURFACE
F. Antonangeli (CNR, Fracati, Italy), C. Calandra (Modena Univ., Italy), E. Colavita (Calabria Univ., Italy), S. Nannarone, C. Rinaldi, and L. Sorba 31 Oct. 1983 25 p refs
(Nota-Interna-811) Avail: NTIS HC A02/MF A01

Reflection energy loss spectral were obtained from a GaAs(110) :H system at several stages of coverage. The fully chemisorbed surface shows several H-induced losses. They were interpreted on the basis of hydride electronic structure and of self-consistent pseudopotential calculations. The results indicate that chemisorption takes place on Ga and As sites of the unrelaxed substrate through covalent directional bonds. Author (ESA)

N85-11890# Siemens A.G., Munich (West Germany). Grundlagenentwicklung.
STUDY OF APPLICATION OF ORGANIC SEMICONDUCTORS TO ELECTRONIC COMPONENTS Final Report, Jun. 1980
Wilhelm Armbruester, Eberhard Guenzel, and Hans-Dieter Feucht Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-142; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,50

Organic semiconductors with thermal stability are examined. Complexes were synthesized from the electronic acceptor tetracyanochinodimethane (TCNQ) and the donor dipyridylethylene, alkylated on the N-atom with -CH3...C8H17. Propyl derivative is found most convenient with respect to electrical, thermal, and chemical properties. Solid Al electrolytic capacitors contacted with this complex are superior or equivalent to solid Ta capacitors in impedance and leakage current, especially at reverse voltage. A disadvantage is the lower capacitance per volume and instability in ac application. Author (ESA)

N85-11019*# Utah Univ., Salt Lake City. Dept. of Physics.
THE ABSENCE OF CONVECTIVE STABILITY IN INCONGRUENT CRYSTAL GROWTH ON EARTH Abstract Only
Franz Rosenberger *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 65 (For primary document see N85-11011 02-12)
(Grant NsG-1534)
Avail: NTIS HC A19/MF A01 CSCL 20B

N85-11023*# Microgravity Research Associates, Inc., Coral Gables, Fla.
PRODUCING GALLIUM ARSENIDE CRYSTALS IN SPACE
Richard L. Randolph *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 82-86 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 20B

N85-11046*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLIDIFICATION AND CRYSTAL GROWTH OF SOLID SOLUTION SEMICONDUCTING ALLOYS Abstract Only
S. L. Lehoczky and F. R. Szofran *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 320 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 20B

N85-11213# De Beers Diamond Research Lab., Johannesburg (South Africa).
THE GROWTH OF TWINS AND TWIN LAMELLAE IN SYNTHETIC DIAMOND CRYSTALS Abstract Only
N. J. Pipkin *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 77 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

N85-11683# Joint Publications Research Service, Arlington, Va.
EFFECT OF LIQUID PHASE COMPOSITION ON THICKNESS OF EPITAXIAL Ga SUB (1-x) Al SUB x As FILMS Abstract Only
N. F. Akbarov, Kh. Kh. Bustanov, M. M. Mirzabayev, I. Eshmetov, and M. N. Tursunov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 18 Transl. into ENGLISH from Izv. Akad. Nauk Ucheb. Zaved. SSR: Ser. Fiz.-Mat. Nauk (Tashkent), no. 1, Jan. - Feb. 1984 p 73-74 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11685# Joint Publications Research Service, Arlington, Va.
COMPOSITION OF METAL FILMS ON GALLIUM ARSENIDE SURFACE Abstract Only
V. G. Aleshin, V. V. Nemoshkalenko, Ye. M. Semashko, and A. I. Senkevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 20-21 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 273, no. 6, Dec. 1983 p 1345-1348 Original language doc. previously announced in IAA as A84-21094 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11686# Joint Publications Research Service, Arlington, Va.
IMPURITY TRAPPING DURING GAS PHASE EPITAXY OF GALLIUM ARSENIDE Abstract Only
L. G. Lavrentyeva *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 24 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Fiz. (Tomsk, USSR), v. 26, no. 10, Oct. 1983 p 31-34 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11687# Joint Publications Research Service, Arlington, Va.
EFFECT OF LIGHT PULSES ON FILM OF CHALCOGENIDE VITREOUS SEMICONDUCTORS Abstract Only
A. V. Kolobov and N. Sebastyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 26 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 1, Jan. 1984 p 186-187 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11688# Joint Publications Research Service, Arlington, Va.
SPECTRAL DISTRIBUTION OF RADIATION IN n JUNCTIONS OF GaAs DURING AVALANCHE BREAKDOWN Abstract Only
B. M. Dzelme, Ya. K. Balodis, T. Ya. Puritis, and Ya. P. Bochkans *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 28 Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR: Ser. Fiz. i Tekhn. Nauk (Riga), no. 2, Mar. - Apr. 1984 p 43-48 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11689# Joint Publications Research Service, Arlington, Va.
COMPLEX FORMATION AND TEMPERATURE STABILITY OF ELECTROPHYSICAL PROPERTIES OF GaAs SEMINSULATING SINGLE CRYSTALS Abstract Only
A. V. Markov, S. P. Grishina, M. G. Milvidskiy, and S. S. Shifrin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 30 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 18, no. 3, Mar. 1984 p 465-470 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11690# Joint Publications Research Service, Arlington, Va.
REVERSIBLE CHANGE IN PARAMETERS OF GaAs-BASED SURFACE-BARRIER METAL-SEMICONDUCTOR DIODES INDUCED BY HYDROGEN ABSORPTION-DESORPTION Abstract Only
B. B. Kuliyev, E. Yu. Salayev, and D. M. Safarov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 31 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 3, Mar. 1984 p 623-625 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11692# Joint Publications Research Service, Arlington, Va.
FORMATION OF LATTICE DEFECTS BY NITROGEN LASER EXPOSURE IN A2B6 SEMICONDUCTORS WITH WIDE FORBIDDEN BAND Abstract Only
G. P. Yablonskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 35 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 4, Apr. 1984 p 995-1001 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11693# Joint Publications Research Service, Arlington, Va.
LOW-THRESHOLD INJECTION LASERS ON GROWN GaInPAs/InP HETEROSTRUCTURES (1.2-1.6 MICROMETERS WAVELENGTHS) Abstract Only
V. P. Adveyeva, V. V. Bezotosnyy, M. G. Vasilyev, L. M. Dolginov, A. Ye. Drakin, V. P. Durayev, P. G. Yeliseyev, N. V. Malkova, M. G. Milvidskiy, B. N. Sverdlov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 35-36 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 3, Mar. 1984 p 551-557 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11694# Joint Publications Research Service, Arlington, Va.
SYMMETRY OF EXCHANGE INTERACTION IN CRYSTALLINE MAGNETIC FILMS Abstract Only
A. Yu. Kozhukhar *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 36-37 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 1, Mar. 1984 p 71-74 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11695# Joint Publications Research Service, Arlington, Va.
PHOTOELECTRIC EFFECT IN LIQUID CRYSTALS Abstract Only
L. K. Vistin, P.-A. V. Kazlauskas, and S. Payeda *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 37-38 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 275, no. 1, Mar. 1984 p 60-63 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11736# Joint Publications Research Service, Arlington, Va.
METHOD OF SPLITTING FOR SOLUTION OF PROBLEMS IN SEMICONDUCTOR PHYSICS Abstract Only
Yu. A. Berezin and N. N. Yanenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 117 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1338-1340 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11741# Joint Publications Research Service, Arlington, Va.
PHOTOCURRENT OSCILLATIONS IN Bi12GeO20 METAL-SEMICONDUCTOR-METAL STRUCTURES Abstract Only
I. S. Zakharov and P. A. Petukhov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 7 Transl. into ENGLISH from Vyssh. Ucheb.: Fiz. (Tomsk), v. 26, no. 12, Dec. 1983

p 101-102 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11742# Joint Publications Research Service, Arlington, Va.
CAPACITIVE REACTANCE OF COMPENSATED SEMICONDUCTORS WITH DEEP CENTERS UNDER CONDITIONS OF TRANSMISSION OF EXCLUSION AND DOUBLE INJECTION CURRENTS Abstract Only
D. A. Aronov and B. R. Mamatkulov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 10-11 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz.-Mat. Nauk (Tashkent), no. 6, Nov. - Dec. 1983 p 32-36 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11744# Joint Publications Research Service, Arlington, Va.
MECHANISMS OF LASER ANNEALING OF SEMICONDUCTORS Abstract Only
V. N. Abakumov, Zh. I. Alferov, Yu. V. Kovalchuk, and Ye. L. Portnoy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 14-15 Transl. into ENGLISH from Fiz. i Tekhn. Poluprov. (Leningrad), v. 17, no. 12, Dec. 1983 p 2224-2228 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11745# Joint Publications Research Service, Arlington, Va.
PHOTOLUMINESCENT PROPERTIES OF EPITAXIAL p-GaSb Abstract Only
N. S. Zimogorova, L. M. Kanskaya, I. V. Kryachko, V. A. Sazonov, and V. I. Shostka *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 15 Transl. into ENGLISH from Fiz. i Tekhn. Poluprov. (Leningrad), v. 17, no. 12, Dec. 1983 p 2228-2230 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11746# Joint Publications Research Service, Arlington, Va.
DETERMINING COMPOSITION IN SURFACE REGION OF SEMICONDUCTOR CRYSTALS BY METHOD OF SUDDEN CHANGES IN X-RAY PHOTOELECTRIC EFFECT Abstract Only
V. N. Shchemelev, I. R. Tagirov, A. Buabellu, and Ye. A. Sozontov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 19 Transl. into ENGLISH from Poverkhn.: Fiz., Khim., Mekhan. (Moscow), no. 11, Nov. 1983 p 56-61 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11747# Joint Publications Research Service, Arlington, Va.
INSTABILITY IN SEMICONDUCTORS EXPOSED TO IONIZING RADIATION Abstract Only
I. V. Verner, S. K. Maksimov, and V. V. Tsukanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 19 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 2, 26 Jan. 1984 p 65-68 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

N85-11750# Joint Publications Research Service, Arlington, Va.
FOCUSING BEAM OF 1-GeV PROTONS WITH VOLUMETRIC CAPTURE TO THE MODE OF CHANNELING BY BENT SINGLE CRYSTAL Abstract Only
V. Andreyev, V. V. Baublis, Ye. A. Damaskinskiy, A. G. Krivshich, L. G. Kudin, V. V. Marchenkov, V. F. Morozov, V. V. Nelyubin, Ye. M. Orishchin, G. Ye. Petrov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-004) 2 Aug. 1984 p 28 Transl. into ENGLISH from Pisma v Zh. Eksperim. i Teor. Fiz. (Moscow), v. 39, no. 2, 25 Jan. 1984 p 58-61 (For primary document see N85-11737 02-70)
Avail: NTIS HC A06/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-11891 Kansas State Univ., Manhattan.
ANALYSIS AND SIMULATION OF THE I C ENGINE OTTO CYCLE USING THE SECOND LAW OF THERMODYNAMICS Ph.D. Thesis
Yousef Mohamed Abdel-Rahim 1984 233 p
Avail: Univ. Microfilms Order No. DA8415637

The present investigation is an application of the second law of thermodynamics to the spark ignition engine cycle. A comprehensive thermodynamic analysis of the air standard cycle is conducted using the first and second laws of thermodynamics, the ideal gas equation of state and the perfect gas properties for air. The study investigates the effect of the cycle parameters on the cycle performance reflected by the first and second law efficiencies, the heat added, the work done, the available energy added as well as the history of the internal, available and unavailable energies along the cycle. The study shows that the second law efficiency is a function of the compression ratio, the initial temperature, the maximum temperature as well as the dead state temperature. A non-dimensional comprehensive thermodynamic simulation model for the actual Otto cycle is developed to study the effects of the design and operating parameters of the cycle on the cycle performance. The analysis takes into account engine geometry, mixture strength, heat transfer, piston motion, engine speed, mechanical friction, spark advance and combustion duration. Dissert. Abstr.

N85-11892# Argonne National Lab., Ill.
GAUGE THEORY ON A LATTICE, 1984: PROCEEDINGS
C. Zachos, ed., aster Cel, W., ed., E. Kovacs, ed., and D. Silvers, ed. Jun. 1984 342 p refs Workshop held at Argonne, Ill., 5 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-014856; CONF-8404119) Avail: NTIS HC A15/MF A01

In the past few years there have been rapid advances in understanding quantum field theory by making discrete approximations of the path integral functional. This approach offers a systematic alternative to perturbation theory and opens up the possibility of first-principles calculation of new classes of observables. Computer simulations based on lattice regularization have already provided intriguing insights into the long-distance behavior of quantum chromodynamics. The objective of the workshop was to bring together researchers using lattice techniques for a discussion of current projects and problems. These proceedings aim to communicate the results to a broader segment of the research community. Separate entries were made in the data base for 26 of the 31 papers presented. Five papers were previously included in the data base. (WHK) DOE

N85-11893# Rome Univ. (Italy). Ist. di Fisica.
THE IDENTIFICATION OF THE SCIENTIFIC COMMUNITY'S CHOICE CRITERIA IN THE HISTORY OF SCIENTIFIC RESEARCH: THE CASE OF QUANTUM MECHANICS [L'IDENTIFICAZIONE DEI CRITERI DI SCELTA DELLA COMMUNITA' DEGLI SCIENZIATI NELLA STORIOGRAFIA E NELLA RICERCA SCIENTIFICA: IL CASO DELLA MECCANICA QUANTISTICA]
M. Cini 2 Dec. 1982 41 p refs In ITALIAN Presented at 3rd Congr. Nazl. di Storia della Fis.
(Nota-Interna-797) Avail: NTIS HC A03/MF A01

The methodology of the history of sicences is discussed and illustrated with the analysis of the quantum mechanics theory development. Kuhn's suggestion, stating that the history of science should be treated as a combination of criteria is developed. The relationship between the scientist and the scientific community is examined, as well as the community choice criteria and the

influence of social structure on the community criteria. The analysis of the quantum mechanics case shows the relevance of studying why some questions were not asked in the considered period, and how this fact may throw light on the whole historical process. Author (ESA)

N85-11894# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
AN UNDERGROUND SEARCH FOR MASSIVE SLOW PARTICLES (HUNTING GRAND UNIFIED THEORY (GUT) MONOPOLES)
G. DeZorzi and D. Zanello 14 Feb. 1984 18 p refs
(Nota-Interna-821) Avail: NTIS HC A02/MF A01

An underground search for superheavy slow moving ionizing particles in order to detect Grand Unified Theory magnetic monopoles is outlined. The experimental method uses a single technique, giving both spatial and time information. A very large area detector (1000 sq m) can be built at a relatively low cost. If monopoles are not found, an upper limit on their flux of 5 times 10 to the minus 16th power/sq cm/sr/sec (90% CL) should be obtained in 2yr running time. The sensitivity of this monopole search would reach values below the Parker bound. Author (ESA)

N85-11895# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
RENORMALIZATION THEORY IN FOUR DIMENSIONAL SCALAR FIELDS
G. Gallavotti and F. Nicolo 1 Jun. 1984 147 p refs
(Nota-Interna-824) Avail: NTIS HC A07/MF A01

A technique to construct field theories without cutoffs is used to derive Hepp's theorem, the De Calan Rivasseau n bounds, and the Borel summability of the planar four dimensional Euclidean field theory. Coordinate space rather than momentum space is used, and the perturbative effective interaction rather than the renormalized Schwinger functions are treated. Author (ESA)

N85-11200# National Physical Research Lab., Pretoria (South Africa).
THERMODYNAMIC CALCULATIONS AND THE CHEMICAL VAPOUR DEPOSITION OF HARD MATERIALS Abstract Only
Angus I. Kingon and Robert F. Davis (North Carolina State Univ.) *In* CSIR Intern. Conf. on Recent Develop. in Spec. Steels and Hard Mater. 1982 p 49-50 (For primary document see N85-11177 02-26)
Avail: NTIS HC A06/MF A01

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-11896# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
DECISION SUPPORT SYSTEM (DSS): A SURVEY
H. W. Ittmann Jun. 1983 34 p refs
(NRIMS-TWISK-317) Avail: NTIS HC A03/MF A01

A survey of Decision Support Systems defines the concept and relates it to other fields. A frame work of the typical functions and components of such a system are presented. Practical applications are discussed for illustrative purposes. Author

N85-11897# Analytics, Inc., Dayton, Ohio.
BENEFIT VALUE TO THE AIR FORCE OF THE GIDEP (GOVERNMENT INDUSTRY DATA EXCHANGE PROGRAM) ALERT Final Report, 30 Sep. 1983 - 15 Jun. 1984
T. McCann 15 Jun. 1984 59 p
(AD-A145470; BRMC-83-5098) Avail: NTIS HC A04/MF A01 CSCL 14/1

The main findings of the report are: (1) The system set up to handle Government Industry Data Exchange Program (GIDEP) ALERTs within the Air Force is not followed in a consistent fashion. (2) All participants in the GIDEP program are required to report the total yearly savings as part of GIDEP ANNUAL PROGRESS REPORT. The majority cost avoidance are not being reported due to lack of data, lack of personnel or lack of a method to accurately determine savings. (3) the GIDEP participants are relatively slow to issue ALERTs. (4) There is no formally documented system for determining that the Air Force's warranty rights are being enforced on items reported under the GIDEP ALERT system. (5) Contractor participation in the GIDEP program is basically voluntary. As a result of analysis of the GIDEP ALERT system, the following changes to ALERT processing procedures were recommended: The Engineering and Reliability branch of material management function at each organization impacted by the ALERT should identify the Part Family Code and complete a Cost Avoidance Estimating Sheet to develop a data base and provide summary cost avoidance statistics by part family to HQ AFLC. GRA

N85-11898# Duke Univ., Durham, N. C. School of Business.
DECISION PROCESS MODELS OF CONTRACTOR BEHAVIOR: THE DEVELOPMENT OF EFFECTIVE CONTRACT INCENTIVES Final Report, 17 Feb. 1981 - 11 Jun. 1984
A. Y. Lewin, K. J. Cohen, and R. C. Morey 11 Jun. 1984 74 p (Contract F33615-81-C-5034)
(AD-A145524; BRMC-81-5034) Avail: NTIS HC A04/MF A01 CSCL 05/1

An objective of this research was to develop a capability to model the potential impact of various incentive schemes on the performance of defense contracts. It was necessary to develop a computer simulation model such basic elements as DOD project goals, DOD incentive mechanisms, contractor goals, and contractor organizational response mechanisms. Each of these elements, which collectively determine the behavioral pattern of the decision process model (DPM), are decoupled and parameterized to facilitate analysis of different incentive schemes and/or behavioral assumptions. The objective of this contract was to validate the DPM simulation and its application to developing and testing alternative incentive schemes. The major practical use of building a DPM type simulation is its ultimate application in answering what if type policy questions involving the design parameters of the contractual relationship between the DOD and defense contractors. For example, the simulation results indicated that increasing the contractor's fee improves cost control performance. The DPM simulation results suggest that the higher the weight (including those assigned to the quality of the proposal) the better the cost control performance and social efficiency. A simulation model of this type has other uses in the training or education of policy makers and or DOD project managers. In business education similar simulation models have been designed as management games. Such games, which can be extremely complex, are used as laboratories for training students to apply analytical tools and integrate functional area knowledge (marketing, production, accounting, financial planning, etc.) within a competitive decision making environment. GRA

N85-11899# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHARACTERISTICS OF SYSTEMS ENGINEERING IN AVIATION SCIENCE RESEARCH
L. Da-Li and W. Jie-Zhi 20 Aug. 1984 16 p Transl. into ENGLISH from Guoji Hangkong (China), no. 2(252), 28-29 Feb. 1984 p 2-5; (AD-A145602; FTD-ID(RS)T-0708-84) Avail: NTIS HC A02/MF A01 CSCL 05/1

There are five phases in aviation science research: fundamental research (to develop scientific theories), applied research (to generate technical projects), preliminary development (to test and

verify technology, leading to product design), model development (to produce prototypes) and improvement after usage (or to develop practical models) Preliminary research and development include fundamental research, applied research and preliminary development. In general, the main objective of the first two phases is to understand the subject, i.e., to explore the aviation science. The objective of the other three phases is to improve the status, that is to develop the aviation technology. Considering aviation science research as a whole, it has many static characteristics such as divisibility, interrelatedness, stepwise progression, integrity, subordinateness, uncertainty, etc. however, the dynamic characteristics are more important which we would like to discuss in detail. That is the systems engineering of the aviation science research. GRA

N85-11900# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
CONSTRAINT-BASED SCHEDULING IN AN INTELLIGENT LOGISTICS SUPPORT SYSTEM: AN ARTIFICIAL INTELLIGENCE APPROACH Annual Report, 15 Mar. 1983 - 14 Mar. 1984
M. S. Fox and S. F. Smith 21 Jul. 1983 16 p
(Contract F49620-82-K-0017)
(AD-A145613; AFOSR-84-0828TR) Avail: NTIS HC A02/MF A01 CSCL 05/1

This report summarizes the progress of research performed during the contract period from March 1982 to March 1984. A theory of hierarchical, opportunistic constraint-directed reasoning for the scheduling of job shops has been the focus of the research. In addition, new research in the areas of constraint-directed diagnosis, and reactive scheduling was initiated. An experimental software system, called ISIS, has continued its evolution and has been tested on simulated plant data. GRA

N85-11055*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPPORTUNITIES FOR COMMERCIAL ORGANIZATIONS Abstract Only
William K. Vardaman, Harry Atkins, and Kenneth R. Taylor *In its* 2nd Symp. on Space Industrialization Oct. 1984 p 369 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

N85-11056*# TRW Space Technology Labs., Redondo Beach, Calif.
SATELLITE SERVICING: A BUSINESS OPPORTUNITY? Abstract Only
Robert E. Wong and Elnathan H. Medler *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 370 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

N85-11057*# Booz-Allen and Hamilton, Inc., Arlington, Va.
DOING BUSINESS IN SPACE: HOW TO GET THERE FROM HERE
Peter W. Wood and Peter M. Stark *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 371-382 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05A

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-11901 Florida State Univ., Tallahassee.
AN INVESTIGATION OF THE USE, COST, PERCEIVED VALUE AND SOCIAL CONTEXT OF TELECOMMUNICATIONS TOOLS IN TWO-YEAR COLLEGE LIBRARIES IN THE SOUTHEASTERN UNITED STATES Ph.D. Thesis
Holton Edwin Lee 1984 285 p
Avail: Univ. Microfilms Order No. DA8416707

A descriptive study of the use, cost, perceived value and social context of telecommunications tools in two year libraries in the Southeast was undertaken. There were three purposes in the study: (1) to describe the cost and use of telecommunictions tools; (2) to investigate the perceived value of these tools; (3) to investigate the social context of the use or non-use of those tools. It was found that few libraries in the Southeast employ telecommunications tools at a high level. There is little money available for such tools and costs are relatively high. When telecommunications tools are employed they receive extensive usage by relatively few students. The technology most in evidence is that pertaining to video machines of various types. Computer technology was decidely under represented, although it was often preferred above other tools. The perception of such tools was positive among librarians, although costs were often perceived as a hinderance to the use of the tools. Dissert. Abstr.

N85-11902 Drexel Univ., Philadelphia, Pa.
COLLECTION OVERLAP AND COORDINATED COLLECTION DEVELOPMENT Ph.D. Thesis
Harry Elvin Broadbent 1984 150 p
Avail: Univ. Microfilms Order No. DA8415622

A fundamental question of library cooperation is addressed: how, in resource sharing library networks, information about collection overlap may help the academic library manager to make decisions about a library's involvement in coordinated collection development for monographs. There was little statistical support for hypotheses linking circulation to holdings. There was some correlation between holdings among the 8 libraries, holdings in the Tri-State College Library network, and holdings in Pennsylvaia, but the 8 libraries held very few unique titles in relation to state-wide holdings. There was no difference in holdings levels by types of publishers; but by broad subject divisions. Science books were more widely held; and books reviewed in Choice were more widely held. There was a weak correlation between the number of reviews and holdings. Despite the similarity of academic programs among the 8 institutions, there was little title overlap. The findings suggest that managers of the libraries studied will find little value in coordinated collection development programs which concern themselves with duplication of monographic titles. Dissert. Abstr.

N85-11903*# Planning Research Corp., McLean, Va. Government Information Systems.
AN OPERATIONAL SYSTEM FOR SUBJECT SWITCHING BETWEEN CONTROLLED VOCABULARIES: A COMPUTATIONAL LINGUISTICS APPROACH Contractor Report, 2 Nov. 1981 - 31 Dec. 1983
June P. Silvester, Roxanne Newton, and Paul H. Klingbiel Washington NASA Oct. 1984 99 p refs
(Contract NASw-3330)
(NASA-CR-3838; NAS 1.26:3838) Avail: NTIS HC A05/MF A01 CSCL 05B

The NASA Lexical Dictionary (NLD), a system that automatically translates input subject terms to those of NASA, was developed in four phases. Phase One provided Phrase Matching, a context sensitive word-matching process that matches input phases words with any NASA Thesaurus posting (i.e., index) term or Use reference. Other Use references have been added to enable the matching of synonyms, variant spellings, and some words with the same root. Phase Two provided the capability of translating any individual DTIC term to one or more NASA terms having the same meaning. Phase Three provided NASA terms having equivalent concepts for two or more DTIC terms, i.e., coordinations of DTIC terms. Phase Four was concerned with indexer feedback and maintenance. Although the original NLD construction involved much manual data entry, ways were found to automate nearly all but the intellectual decision-making processes. In addition to finding improved ways to construct a lexical dictionary, applications for the NLD have been found and are being developed. Author

N85-11904# Royal Signals and Radar Establishment, Malvern (England).
ADAM: AN ABSTRACT DATABASE MACHINE
N. E. Peeling, J. D. Morison, and E. V. Whiting May 1984 40 p refs
(RSRE-84007; BR92291) Avail: NTIS HC A03/MF A01

A set of read/write and disk management procedures is described. It extends a programming language to allow data on disk to be handled as easily as in-store data. The procedures work within standard random-access files in the filestore of the host operating system. Author (ESA)

N85-11905# Advanced Information and Decision Systems, Mountain View, Calif.
DISTRIBUTED HYPOTHESIS TESTING IN DISTRIBUTED SENSOR NETWORKS Interim Report, 15 Jul. 1983 - 14 Jul. 1984
C. Y. Chong, S. Mori, M. R. Fehling, K. C. Chang, and R. P. Wishner Jul. 1984 155 p
(Contract MDA903-83-C-0372; DARPA Order 4272)
(AD-A145434; AI/DS-TR-1048-02) Avail: NTIS HC A08/MF A01 CSCL 09/4

This report presents research results on distributed situation assessment in distributed sensor networks (DSNs). Information fusion algorithms for hypothesis formation and evaluation are presented. The algorithms are based on the concept of an information graph. A theory for tracking groups of targets has been developed based on a Bayesian Theory for multitarget tracking. Finally the representation of knowledge and architecture for a testbed to design and test a DSN are discussed. Author (GRA)

N85-11906# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
A MANAGEMENT WORKSTATION CONCEPT
S. Berkowitz Jul. 1984 35 p
(AD-A145617; DTNSRDC/CMLD-84/17) Avail: NTIS HC A03/MF A01 CSCL 05/2

The David Taylor Naval Ship R&D Center is designing an automated, paperless environment for logistics functional managers at HQ, Naval Supply System Command. This paper asserts that technology is currently available to radically change the way that the logistics or financial manager deals with his business environment. The change would affect both quantitative and qualitative aspects of his work environment. In principle, the manager could summon up large volumes of data with a touch of a finger and gain analytical insight by interacting with and interpreting graphics displays. He could instantaneously communicate his newly-found perceptions and decisions through voice and hand-drawn sketches to a select, remote audience without benefit of keyboard and paper. As a practical matter, however, the separate technologies that would accommodate such office power still need to be integrated at a marketable price. Moreover, keyboard and paper may be preferable modes of entry for some managers. Until continuous speech and unconstrained hand-lettered recognition become practical realities for large vocabularies, mundane activities such as editing (formatting, composition, publication, distribution) may best be left to a support staff. GRA

N85-11907# Stanford Univ., Calif. Dept. of Computer Science.
ON UPDATE SEMANTICS AND RELATIONAL VIEWS
A. M. Keller 1984 3 p
(Grants N00039-82-G-02506; AF-AFOSR-0212-80; AF-AFOSR-0710-84)
(AD-A145622; AFOSR-84-0710TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A shared database encompasses data of interest to a variety of users. A database view provides a class of users with an image of a portion of the data presented according to the needs of these users. The ability to translate updates specified against the view into updates specified against the database is necessary to allow more effective use of views. Since a user accessing the database through a view has limited knowledge of the entire domain of the database, it is necessary to limit the effect on others of a particular user's view update. Furthermore, there may be many ways to translate a particular view update into database updates. Bancilhon and Spyratos propose the notion of a constant complementary view, which partially solves the problem of view updates by addressing these two issues. The authors present a reasonable view update translator that does not preserve any complement. This illustrates the restrictive consequences of the requirement that a complement remain constant. Author (GRA)

N85-11908# Hawaii Inst. of Geophysics, Honolulu.
ARCHIVING AND EXCHANGE OF A COMPUTERIZED MARINE SEISMIC DATABASE: THE ROSE (RIVERA OCEAN SEISMIC EXPERIMENT) DATA ARCHIVE SYSTEM Final Report
S. L. LaTraille Dec. 1983 146 p
(Contract N00014-82-C-0380; Grant NSF EAR-80-02124)
(AD-A145658; HIG-83-3; HIG-DATA-43) Avail: NTIS HC A07/MF A01 CSCL 08/10

A central data exchange facility was organized at Hawaii Institute of Geophysics to manage seismic data collected during project ROSE (the Rivera Ocean Seismic Experiment), a large marine seismic experiment. Prior to that experiment, wide consultation was made and much effort was expended in the establishment of a uniform, yet flexible, data exchange format. The participating institutions provided their data to the facility where the data were catalogued and distributed. This report describes in detail the processes and computer programs used to catalog, store and distribute the ROSE seismic data. The users and I hope that exchange of data from other experiments will be facilitated by use of the ROSE format and these programs. GRA

N85-11909# Freie Univ., Berlin (West Germany). Abteilung Dokumentation.
INCLUSION OF AUDIOVISUAL MEDIA IN INFORMATION SERVICES FOR THE SPECIAL SUBJECTS JOURNALISM AND COMMUNICATION SCIENCE (PILOT STUDY) Final Report, Jan. 1982
Jens Hertwig, Bettina Koeppel, Bernd Meyer, Ulrich Neveling, Susanne Plagemann, Thomas Seeger, Dietmar Strauch, and Gernot Wersig Bonn Bundesministerium fuer Forschung und Technologie Jun. 1983 194 p refs In GERMAN; ENGLISH summary
(BMFT-FB-ID-83-004; ISSN-0170-8996) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

Inclusion of tapes, records, films, sound and video-cassettes, and radio and TV manuscripts in information services for journalism-/communication science is examined. Data format, specification of documentation languages, design of information services, and structural problems of a service oriented coordination were tested. Suppositions for an exemplary, issue-related information activity are given. Author (ESA)

N85-11910# Cologne Univ. (West Germany). Betriebswirtschaftliches Institut fuer Organisation und Automation.
BUSINESS PLANNING FOR INFORMATION SERVICES UNDER SPECIAL CONSIDERATION OF GERMAN MANAGEMENT INFORMATION SYSTEMS Final Report, Jun. 1978
Norbert Szyperski, Lothar Berens, Klaus Hoering, Wolfgang Steinbrecher, and Matthias Wolff Bonn Bundesministerium fuer Forschung und Technologie Jul. 1983 161 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-83-007; ISSN-0170-8996) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

Data base services, information brokers, management information systems, publishers and information consultants are examined. In order to assist these planning activities decision support systems were developed. Methods for industrial management development planning; computer aided planning model; data logging; and analysis of pilot systems are described. Author (ESA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N85-11014*# Coopers and Lybrand, Washington, D.C.
FINANCIAL ISSUES FOR COMMERCIAL SPACE VENTURES: PAYING FOR THE DREAMS
John J. Egan *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 38-47 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05C

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-11911# Committee on Science and Technology (U. S. House).
INTERNATIONAL COOPERATION AND COMPETITION IN SPACE
Washington GPO 1984 230 p refs Hearing before the Comm. on Sci. and Technol., 98th Congr., 2d Sess., No. 104, 25 Jul. 1984
(GPO-38-001) Avail: Subcommittee on Space Science and Applications

Testimony and dialogue from a meeting of the House Subcommittee on Space Science and Applications are presented. The Subcommittee met to survey the status of and prospects for international cooperation and competition in space. For individual titles, see N85-11912 through N85-11917.

N85-11912# Committee on Science and Technology (U. S. House).
INTERNATIONAL COOPERATION AND COMPETITION IN SPACE. INTRODUCTION
In its Intern. Coop. and Competition in Space 1984 p 1-32 ref (For primary document see N85-11911 02-84)
Avail: Subcommittee on Space Science and Applications

Testimony given during a meeting of the House Subcommittee on Space Science and Applications is presented. The Subcommittee met to survey the status of and prospects for international cooperation and competition in space. Expendable launch vehicles and the space shuttle program were discussed. The U.S. position vis-a-vis the U.N. Committee on the Peaceful Use of Outer Space (COPUOS) was addressed. R.S.F.

N85-11913# Committee on Science and Technology (U. S. House).
STATEMENT OF KENNETH S. PEDERSEN, DIRECTOR, INTERNATIONAL AFFAIRS DIVISION, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Intern. Coop. and Competition in Space 1984 p 33-47 (For primary document see N85-11911 02-84)
Avail: Subcommittee on Space Science and Applications

Testimony given during a meeting of the House Subcommittee on Space Science and Applications is presented. The Subcommittee met to survey the status of and prospects for international cooperation and competition in space. The space station was a focal point of the discussion. Examples of joint U.S. and foreign efforts in space technology are cited: the infrared astronomical telescope, COSPAS-SARSAT, spacelab, and the remote manipulator system. R.S.F.

N85-11914# Committee on Science and Technology (U. S. House).
STATEMENT OF OTHO E. ESKIN, DIRECTOR, OFFICE OF ADVANCED TECHNOLOGY, DEPARTMENT OF STATE
In its Intern. Coop. and Competition in Space 1984 p 48-70 (For primary document see N85-11911 02-84)
Avail: Subcommittee on Space Science and Applications

Testimony given by a representative of the Department of State during a meeting of the House Subcommittee on Space Science and Applications is presented. The future participation of the United States in the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) is discussed. The results of the meeting of COPUOS in Vienna in June, 1984 are assessed. R.S.F.

N85-11915# Committee on Science and Technology (U. S. House).
STATEMENT OF JOHN H. MCELROY, ASSISTANT ADMINISTRATOR FOR ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICES, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
In its Intern. Coop. and Competition in Space 1984 p 71-107 (For primary document see N85-11911 02-84)
Avail: Subcommittee on Space Science and Applications

Testimony given by a representative of NOAA during a meeting of the House Subcommittee on Space Science and Applications is presented. The efforts of NOAA in the following space-related international activities are reviewed: (1) exchange of weather data; (2) polar orbiters; (3) coordination of satellite system planning and ocean satellite system planning and ocean satellite activities; (4) assistance in drought impact assements; (5) satellite-aided search and rescue; and (6) LANDSAT satellites. R.S.F.

N85-11916# Committee on Science and Technology (U. S. House).
INTERNATIONAL COOPERATION AND COMPETITION IN CIVILIAN SPACE ACTIVITIES, SUMMARY, APPENDIX 1
In its Intern. Coop. and Competition in Space 1984 p 109-140 refs (For primary document see N85-11911 02-84)
Avail: Subcommittee on Space Science and Applications

The major findings of an assessment requested by the House Committee on Science and Technology and the Joint Economic Committee on international cooperation and competition in civilian space activities are presented. The United States still enjoys a strong competitive position in most space technologies and in space science. There continues to be broad support for a long-term public commitment to civilian space activities. But precisely because of our achievements-and those of other space faring nations--the number of opportunities (and associated costs) that lie before us require a thoughtful articulation of space goals and objectives. Such good goals should refect a broad public consensus, including, but not limited to, those with obvious stake holdings in the space program. Defining these goals may be essential if the United States hopes to maintain its position of leadership at a reasonable cost. The newly authorized National Commission on Space could help to focus the national debate. Maintaining a space program well-integrated with other national objectives also requires attention to the quantity and quality of cooperative international space projects. The United States must cooperate in space in order to stay competitive. R.S.F.

N85-11917# Committee on Science and Technology (U. S. House).
NESDIS INTERNATIONAL ACTIVITIES, APPENDIX 2
In its Intern. Coop. and Competition in Space 1984 p 141-184 (For primary document see N85-11911 02-84)
Avail: Subcommittee on Space Science and Applications

This document summarizes the current international activities of the National Environmental Satellite, Data, and Information Service of the National Oceanic and Atmospheric Administration. Virtually every element of NESDIS programs includes international activity of some sort. The NESDIS Data Centers are part of a global data network. The NESDIS satellites provide data of the entire globe in collaboration with other nations. NOAA's satellite and information programs are highly dependent upon successful international cooperation. NESDIS' international partners play an essential role and NESDIS programs could not be carried out without their assistance. Successful international programs involve sharing both benefits and responsibilities. The NOAA activities meet this criterion. NOAA is an agency with global interests and responsibilities in the oceans and atmosphere. This leads inevitably to cooperative international programs in space applications. This effort is a first step in documenting the breadth and extent of that international cooperation. R.S.F.

N85-11013*# National Aeronautics and Space Administration, Washington, D. C.
LEGAL CONSIDERATIONS AND COOPERATIVE OPPORTUNI-

TIES FOR SPACE COMMERCIAL ACTIVITIES
S. Neil Hosenball *In* NASA. Marshall Space Flight Center 2nd Symp. on Space Industrialization Oct. 1984 p 28-37 (For primary document see N85-11011 02-12)
Avail: NTIS HC A19/MF A01 CSCL 05D

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-11107# Joint Publications Research Service, Arlington, Va.
SPACE RESEARCH BENEFITS NATIONAL ECONOMY
I. Yegorova and Yu. Zaytsev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 84-94 Transl. into ENGLISH from Politicheskoye Samobrazovaniye (Moscow), no. 1, Jan. 1984 p 58-66 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

88 SPACE SCIENCES (GENERAL)

N85-11918# Rome Univ. (Italy). Ist. di Fisica.
FRACTALS: FROM SNOW FLAKES TO GALACTIC CLUSTERS [FRATTALI: DAI FIOCCHI DI NEVE AGLI AMMASSI DI GALASSIE (PASSANDO PER L'IBM)]
L. Peliti and A. Vulpiani 22 Nov. 1982 36 p refs In ITALIAN (Nota-Interna-796) Avail: NTIS HC A03/MF A01

The fractal concept is explained by physical and mathematical examples, including Brownian movement, space distribution of cosmic objects, coastal contour dimensions and bidimensional models of conductor-isolator mixes. The Hansdorff dimension is applied to the Von Kock curve and to various physical problems.
Author (ESA)

N85-11734# Joint Publications Research Service, Arlington, Va.
GRAVITATIONAL VACUUM Abstract Only
L. Sh. Grigoryan and G. S. Saakyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 113 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1352-1357 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

N85-11735# Joint Publications Research Service, Arlington, Va.
LINEAR CONFORMAL GRAVITATION Abstract Only
M. Ya. Palchik and Ye. S. Fradkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-006) 12 Sep. 1984 p 114 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1345-1348 (For primary document see N85-11676 02-70)
Avail: NTIS HC A08/MF A01

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-11919 Princeton Univ., N. J.
A SEARCH FOR LOW LUMINOSITY PULSARS AND ITS IMPLICATIONS FOR THE PULSAR LUMINOSITY FUNCTIONS Ph.D. Thesis
Rachel J. Dewey 1984 154 p
Avail: Univ. Microfilms Order No. DA8415021

A search designed primarily to be sensitive to nearby, intrinsically faint pulsars was carried out between December 1982 and May 1983 using the NRAO 300' telescope at Green Bank, West Virginia. This search detected a total of 83 pulsars, 34 of which were new discoveries. This search was sensitive to intrinsically faint pulsars over a larger area of the sky than any previous search, and its results provide significant information about the behavior of the pulsar luminosity function at low luminosities. Monte Carlo calculations were used to derive the expected search results for various assumed forms of the luminosity function; evidence was found for a significant drop in the luminosity function below intrinsic luminosities of about 3.5 mjy kpc(2). The existence of this turn over makes it possible to reliably estimate the local surface density of pulsars. This suggests that the total number of pulsars in the Galaxy is about 120,000 and that one pulsar must be formed every 40 years in order to sustain this galactic population. Such a birthrate is consistent with the formation of all pulsars in supernova explosions. Dissert. Abstr.

N85-11920 Arizona Univ., Tucson.
MULTIPLE OBJECT SPECTROSCOPY: THE MX SPECTROMETER DESIGN Ph.D. Thesis
John Milton Hill 1984 218 p
Avail: Univ. Microfilms Order No. DA8415068

Techniques involved in using a fiber optic coupled spectrometer to do multiple object spectroscopy of astronomical objects are described. The Medusa spectrograph, with optical fibers fixed in a focal plane aperture plate, was used to study clusters of galaxies via velocity distributions. Some relevant problems in the study of the structure and dynamics of clusters of galaxies are outlined as motivation for building a multiple fiber spectrometer. The history of fiber optic spectroscopy in astronomy is presented along with an outlook for the future. The results and experience gained from the Medusa spectrograph are used to design a second generation instrument. The MX Spectrometer uses optical fibers which are positioned remotely under computer control. These fibers are optically matched to the telescope and spectrograph optics to achieve optimum performance. The transmission, flexibility and image scrambling properties of step-index silica fibers allow efficient reformatting of multiple objects into the spectrometer entrance aperture. Dissert. Abstr.

N85-11921 Florida Univ., Gainesville.
VARIATIONS OF THE H AND K EMISSION LINES OF SINGLY IONIZED CALCIUM IN THE ECLIPSING BINARY STAR SYSTEM AR LACERTAE Ph.D. Thesis
Sara Witherow Hoffman 1983 217 p
Avail: Univ. Microfilms Order No. DA84015127

The variability of the Ca (II) emission and the association of any such variation with the photometric behavior and with other characteristics of AR Lac were considered. A series of spectrographic plates spanning the entire orbital cycle of AR Lac was examined. Reduction of the K-line emission data revealed emission throughout the cycle and emission eclipses well-correlated in phase with the photometric eclipses. An interrelationship of Ca II emission, the distortion wave, and the period changes in AR Lac was tentatively demonstrated. A re-evaluation of contradictory reports regarding the visibility of individual starspots led to the conclusion that large spots would indeed be observable with equipment of high precision. A comprehensive physical and evolution model for the cumulative spectroscopic and photometric behavior of AR Lac was constructed by augmentation of other models and incorporation of the results of the present investigation. Dissert. Abstr.

N85-11922*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.
CLOUDS ABOVE THE MARTIN LIMB: VIKING OBSERVATIONS
Leonard J. Martin, William A. Baum, Lawrence H. Wasserman, and Tobias J. Kreidl 1984 65 p refs Submitted for publication

(Grant NsG-7530)
(NASA-CR-174027; NAS 1.26:174027) Avail: NTIS HC A04/MF A01 CSCL 03A

Whenever Viking Orbiter images included the limb of Mars, they recorded one or more layers of clouds above the limb. The height above the limb and the brightness (reflectivity) of these clouds were determined in a selected group of these images. Normalized individual brightness profiles of three separate traverses across the limb of each image are shown. The most notable finding is that some of these clouds can be very high. Many reach heights of over 60 km, and several are over 70 km above the limb. Statistically, the reflectivity of the clouds increases with phase angle. Reflectivity and height both appear to vary with season, but the selected images spanned only one Martian year, so the role of seasons cannot be isolated. Limb clouds in red-filter images tend to be brighter than violet-filter images, but both season and phase appear to be more dominant factors. Due to the limited sample available, the possible influences of latitude and longitude are less clear. The layering of these clouds ranges from a single layer to five or more layers. Reflectivity gradients range from smooth and gentle to steep and irregular. M.G.

N85-11923*# Washington Univ., Seattle.
SEARCH FOR WHITE DWARF COMPANIONS OF COOL STARS WITH PECULIAR ELEMENT ABUNDANCES Report, period Autumn 1982 - Autumn 1984
E. Boehm-Vitense 1984 9 p
(Grant NsG-5398)
(NASA-CR-174030; NAS 1.26:174030) Avail: NTIS HC A02/MF A01 CSCL 03A

A search for a white dwarf companions of cool stars with peculiar element abundances was undertaken. One additional star the xi Cet, was found with a white dwarf companion. It was found that HR 1016, 56Uma, 16 Ser, have high excitation emission lines which indicate a high temperature object in the system. It is suggested that since these indications for high temperature companions were seen for all nearby Ba stars, it is highly probable that all Ba stars have white dwarf companions, and that the peculiar element abundances seen in the Ba stars are due to mass transfer. Observations, arguments and conclusions are presented. White dwarf companions were not found. Together with the Li and Be abundances and the chromospheric emission line spectra in these stars were studied. No white dwarf companions were seen for subgiant CH stars. E.A.K.

N85-11924# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
THE MAPPING OF THE SUN AT 8 MM WAVELENGTH AND TRACKING OF THE ACTIVE REGIONS IN THE PERIOD 23 MAY - 5 JUNE 1983
A. Tlamicha, S. Urpo, and H. Teraesranta 1983 52 p refs
(Rept-S-149; ISBN-951-752-961-9; ISSN-0355-5712) Avail: NTIS HC A04/MF A01

A 36.8 GHz radio telescope observed solar radiation once a day for two weeks. Lists of the daily mapping of the Sun, of tracking of active regions, and of microwave bursts are given. The maps are presented. Author (ESA)

N85-11094# Joint Publications Research Service, Arlington, Va.
FAST HARTMANN METHOD FOR PROBLEMS IN ASTRONOMICAL ADAPTIVE OPTICS Abstract Only
T. I. Balakhovskaya, V. I. Borisenko, E. A. Vitrichenko, K. L. Maslennikov, A. M. Prokhorov, R. Z. Sagdeyev, Ye V. Trushin, and L. S. Chesalin *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 68 v. 274, no. 5, Feb. 1984 p 1057-1060 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11097# Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF 15 RADIO GALAXIES FROM BOLOGNA SURVEY USING RATAN-600 RADIO TELESCOPE Abstract Only
V. G. Malumyan *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 P 70 Transl. into ENGLISH from Pisma V Astron. Z. (Moscow), v. 10, no. 2, Feb. 1984 p 90-93 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-11925 Florida Univ., Gainesville.
THERMAL EFFECTS IN STELLAR PULSATIONS Ph.D. Thesis
William Dean Pesnell 1983 137 p
Avail: Univ. Microfilms Order No. DA8415150

A Sturm-Liouville operator, embedded in the linearized radial pulsation equations, is used to analyze the thermal effects of stellar pulsations. Asymptotic expansions are utilized to demonstrate the nature of these eigenfunctions and to define the thermal response time of a stellar model. The eigenvalues and eigenvectors for models of a Cepheid and Beta Cephei variable are given showing the differences in the two classes of variables. The time scales introduced agree with earlier ones in their common use of predicting the location of possible driving zones. In addition, a way of displaying the temperature variations in the hydrogen ionization zone without the customary spike is demonstrated, and a new class of pulsations, called sudden modes, is introduced.
Dissert. Abstr.

N85-11926# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOME CONSIDERATIONS ON ELLIPTIC HELIOCENTRIC ORBITS [ALGUMAS CONSIDERACOES SOBRE ORBITAS ELIPTICAS HELIOCENTRICAS]
C. J. Zamlutti Aug. 1984 37 p refs In PORTUGUESE; ENGLISH summary Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3217-PRE/570) Avail: NTIS HC A03/MF A01

Some aspects of periodically cycling orbits (elliptic orbits) for which the central force is due to the Sun are discussed. First physical and geometrical concepts needed for the development are introduced. Then, the matter is particularized to heliocentric orbits, considered relative to the plane of the Earth's orbit around the Sun. The material is delt with in accessible form to non-expert readers. Author

N85-11088# Joint Publications Research Service, Arlington, Va.
HELIUM ATOMS IN INTERSTELLAR AND INTERPLANETARY MEDIA, PART 3: TEMPERATURE AND VELOCITY OF INTERSTELLAR WIND Abstract Only
V. G. Kurt, Ye. N. Mironova, Zh.-L. Berto, and F. Dalode *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 64-65 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p 225-237 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11093# Joint Publications Research Service, Arlington, Va.
PRECIPITATION OF PROTONS WITH E SUB p APPROXIMATELY 1 MeV NEAR PLASMOPAUSE Abstract Only
P. V. Vakulov, S. N. Yemelyanenko, V. A. Kutnetsova, S. N. Kutnetsov, K. Kudela, and B. Popelyavska *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 67 Transl. into ENGLISH from Kosm. Issled. (Moscow) v. 22, no. 2, Mar. - Apr. 1984 p 315-318 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N85-11927*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
URANUS AND NEPTUNE
Jay T. Bergstralh, ed. Washington Oct. 1984 605 p refs Workshop held in Pasadena, Calif., 6-8 Feb. 1984
(NASA-CP-2330; NAS 1.55:2330) Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

A scientific framework within which to plan the Voyager encounters with Uranus and Neptune was sought. Specific objectives were: (1) to assess the current state of knowledge of Uranus and Neptune, their magnetospheres, and their respective systems of satellites and rings (if any), (2) to identify important scientific issues that can be addressed effectively by Voyager, and (3) to provide an opportunity for Voyager investigators to interact with other scientists knowledgeable in the field of physical studies of the Uranian and Neptunian systems. For individual titles, see N85-11928 through N85-11956.

N85-11928*# Arizona Univ., Tucson. Dept. of Planetary Sciences.
THE ORIGIN AND EVOLUTION OF URANUS AND NEPTUNE
John S. Lewis *In* JPL Uranus and Neptune Oct. 1984 p 3-24 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The present state of understanding of the origin and evolution of the planets Uranus and Neptune is briefly reviewed. Emphasis is placed on the need for improved physical and composition data on both planets, particularly those data needed to resolve certain major inconsistencies in the present data set. Author

N85-11929*# Arizona Univ., Tucson. Lunar and Planetary Lab.
ATMOSPHERES OF URANUS AND NEPTUNE
Donald M. Hunten *In* JPL Uranus and Neptune Oct. 1984 p 27-54 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Current knowledge of the atmospheric compositions and structures are surveyed. Although the two planets are similar in some ways, they are strikingly different in a number of others. The similarities include mass, size, and effective temperature. There are differences in heat flow, stratospheric thermal structure and composition, and spectral appearance. Presumably these are traceable to some combination of Uranus' unusual obliquity and smaller distance from the sun, but most of the details are obscure. Author

N85-11930*# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
AERONOMY
S. K. Atreya *In* JPL Uranus and Neptune Oct. 1984 p 55-88 refs Sponsored by the NASA Planetary Atmospheres Program and the NASA/JPL Voyager Project (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

From the known composition (H2, CH4, C2H2(?) at Uranus, and H2, CH4, C2H6 at Neptune) and the inversion and photolysis region temperatures, reasonable theoretical models for the upper atmospheric distribution of the neutral and ionospheric species are constructed on the basis of the expected physical and chemical processes. The models indicate that C2H2 would condense over an extensive height range of Uranus. The extent of the haze is expected to be smaller and deeper in the polar region. Some ethane is also expected to condense, mostly in the vicinity of the temperature inversion. The behavior of the acetylene condensation with latitude and time appears to be consistent with its apparent abundance variation (detected by IUE), and the brightening of Uranus observed in ground based imaging. Neptune's polar region, on the other hand is expected to be more hazy or cloudy than the equatorial region. Author

N85-11931*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TEMPERATURE STRUCTURES AND INFRARED-DERIVED PROPERTIES OF THE ATMOSPHERE OF URANUS AND NEPTUNE
Glenn S. Orton and John F. Appleby *In its* Uranus and Neptune Oct. 1984 p 89-156 refs (For primary document see N85-11927 02-91)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Temperature structures of Uranus and Neptune are currently derivable from a combination of stellar occultation and thermal radiance observations. The globally averaged temperatures of Uranus and Neptune appear quite similar in their convective regions, reaching temperatures near 75 K at 1 bar and 150 K near 10 bar. Temperature minima near 200 mbar are also similar, near 53 to 55 K. The temperature in the stratosphere of Neptune rises much more steeply with altitude than for Uranus in the range of 0.1 to 100 mbar. Above this level, near 1 ubar, both atmospheres reach temperatures of 120 to 160 K. The bolometric radiant energy output is equivalent to the output of a blackbody at 58.3 + or - 2.0 K for Uranus and 60.3 + or - 2.0 for Neptune. These values imply approximate equilibrium with absorbed sunlight for Uranus but an internal energy source 1.9 to 2.6 times the absorbed sunlight for Neptune. The implication of the thermal spectra is that while the bulk composition may be consistent with a solar mixture of H2 and He, the mixing ratio of CH4 is probably about 2% in the deep atmospheres of both planets. Author

N85-11932*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Science.
ULTRAVIOLET OBSERVATIONS OF URANUS AND NEPTUNE BELOW 3000 ANGSTROM
John Caldwell, Richard Wagener, Tobias Owen, Michel Combes (Observatoire de Paris, France), and Therese Encrenaz (Observatoire de Paris, France) *In* JPL Uranus and Neptune Oct. 1984 p 157-177 refs (For primary document see N85-11927 02-91)
(Grant NsG-5250)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

From 2000 to 3000 A, both Uranus and Neptune have albedos that are about two times higher than Jupiter or Saturn's, implying that the outer giants have stratospheres that are relatively free of aerosol absorption. Uncertainties in the absolute calibration procedure allow discrepancies of order 15% between conservative models and the observations. A small amount of aerosol absorption is therefore possible. Below 2000 A the derived albedo is highly dependent on the solar spectrum source used in the data reduction. The most recent result for Uranus, first reported here, is consistent with a secular change in C2H2 mixing ratio from approximately three times ten to the minus eight in 1980 to less than or equal to ten to the minus ninth in 1983. These values are approximately 2 orders of magnitude less than the mixing ratios of this gas on Saturn, and comparable to the amount on Jupiter. M.A.C.

N85-11933*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROPERTIES OF THE UPPER TROPOSPHERES OF URANUS AND NEPTUNE DERIVED FROM OBSERVATIONS AT VISIBLE TO NEAR-INFRARED WAVELENGTHS
Jay T. Bergstralh and Kevin H. Baines *In its* Uranus and Neptune Oct. 1984 p 179-212 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Photons at wavelengths between 0.3 and 4.5 microns penetrate the atmospheres of Uranus and Neptune to pressures between about 0.01 bar and 10 bars. This pressure range brackets the radiative convective boundary in both atmospheres and is therefore

designated upper troposphere. Physical processes which govern the transfer of radiation in Uranus's and Neptune's atmospheres at these wavelengths include Rayleigh/Raman scattering by hydrogen, scattering and broadband absorption by suspended aerosol particles and absorption in discrete bands and lines by methane and hydrogen. Consequently, tropospheric properties constrained by observations at these wavelengths include optical properties and distribution of aerosol particles, methane/hydrogen ratio, and ortho/para hydrogen ratio. Recent observations of Uranus and Neptune in this spectral range, are reviewed and compared with predictions based on models of the atmospheric structures. Significant results for Uranus include the presence of an opaque lower boundary to the visible atmosphere very near the level corresponding to 2 bars pressure, and consequently a methane/hydrogen ratio no less than 3 percent. M.A.C.

N85-11934*# Arizona Univ., Tucson. Lunar and Planetary Lab.
NEAR INFRARED IMAGING OF URANUS AND NEPTUNE
Bradford A. Smith *In* JPL Uranus and Neptune Oct. 1984 p 213-223 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Imaging of Uranus and Neptune in the deep methane absorption band at 890nm is used to detect high altitude atmospheric hazes and to search for possible undiscovered close in satellites. The appearances of Uranus and Neptune are very different from one another and Uranus seems to be changing with time. The Neptune images show rotation in the direct sense. M.A.C.

N85-11935*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A REVIEW OF THE MILLIMETER AND CENTIMETER OBSERVATIONS OF URANUS
Samuel Gulkis and Imke dePater (California Univ., Berkeley) *In its* Uranus and Neptune Oct. 1984 p 225-262 refs (For primary document see N85-11927 02-91)
(Contract NAS7-100; Grant NSF ASF-84-05358)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Millimeter and centimeter wave astronomical data of Uranus are presented and discussed. Some recent observations of the brightness distribution across the disk at 2 cm and 6 cm wavelength are reported. Data related to the variability of the microwave spectrum are reanalyzed, taking into account the strong variation of temperature with wavelength, and including up to date data. The results indicate that the brightness temperatures of Uranus have probably reached their maximum values. The evidence for the depletion of ammonia in the upper atmosphere is discussed. M.A.C.

N85-11936*# California Inst. of Tech., Pasadena. Geological and Planetary Sciences Div.
ATMOSPHERIC DYNAMICS OF URANUS AND NEPTUNE: THEORETICAL CONSIDERATIONS
Andrew P. Ingersoll *In* JPL Uranus and Neptune Oct. 1984 p 263-269 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The atmospheric dynamics of neptune and uranus are investigated. Uranus, because of its pole on orientation and low internal heat source, is in a dynamically different atmospheric regime from Jupiter and Saturn. Neptune resembles Jupiter and Saturn in orientation and internal heating, but its extremely long radiative time constant puts Neptune in a different class. Voyager observations of seasonal temperature gradients, equator to pole temperature gradients, infrared emission, Bond albedo, possible cloud structures (bands, spots, eddies), and cloud motions can be used to improve the ability to classify planetary atmospheres according to their dynamical regimes. M.A.C.

N85-11937*# New Mexico State Univ., Las Cruces.
THE POSSIBILITY OF DETECTION AND MEASUREMENT OF CLOUD STRUCTURE IN THE ATMOSPHERE OF URANUS
Reta Beebe *In* JPL Uranus and Neptune Oct. 1984 p 271-278 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Historical data concerning variability of surface brightness of the visible cloud deck are reviewed. The data do not rule out low contrast small cloud structures of the type measured in the Saturnian Voyager wind measurements. Convective models in which methane can condense suggest similar structure may be present at the level of the visible cloud deck in Uranus' atmosphere. Horizontal space and time scales derived from dynamical considerations lie within the accessible range of the wide and narrow angle Voyager cameras. Therefore, Voyager 2 may obtain significant dynamical information about the Uranian atmosphere. Author

N85-11938*# Hawaii Univ., Honolulu. Inst. of Astronomy.
VARIABILITY OF NEPTUNE
Dale P. Cruikshank *In* JPL Uranus and Neptune Oct. 1984 p 279-287 refs (For primary document see N85-11927 02-91)
(Grant NGL12-001-057; Grant NGL-12-001-057)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Earth based observers of Neptune found that the planet varies in brightness at various wavelengths in ways that suggest that changes occur in the planet's atmosphere on several different time-scales. Global inhomogeneities in high altitude haze distribution that are stable for several days permit measurements of the planet's rotation period (about 18 hours), but this stability sometimes breaks down, obscuring the diurnal lightcurve. In addition, there is an apparent long term variability of the brightness of Neptune in anticorrelation with the cycle of solar activity. This slow variability of low amplitude may be punctuated by outbursts of high altitude condensation of particles in the atmosphere, whose decay time is several months. Author

N85-11939*# Arizona Univ., Tucson. Dept. of Planetary Sciences.
INTERIOR STRUCTURE OF URANUS
W. B. Hubbard *In* JPL Uranus and Neptune Oct. 1984 p 291-325 refs (For primary document see N85-11927 02-91)
(Grant NsG-7045)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Key measurements are discussed which are diagnostic of Uranus' interior structure and evolutionary history, and reviews their present status. Typical interior models have chondritic cores, but have the bulk of their mass in an envelope consisting of ice component, principally H2O. The total amount of free H2 in the planet cannot exceed approximately 1 to 2 earth masses. Measurements of the gravitational moments of Uranus are beginning to be accurate enough to constrain models, but are limited in utility by uncertainty in the rotation period. Discussed is evidence that the outermost planetary layers have a gravitationally significant quantity of denser material (ice component?) in addition to H2 and He. The He/H ratio and the deuterium abundance in the atmosphere may be diagnostic of the planet's previous evolutionary history. It is argued that the planet's interior is likely to now be at a temperature approximately 10(3) deg K. Uranus' interior with Neptune's in a number of ways, considering heat flow, degree of internal differentiation, and possible magnetic field. Author

N85-11940*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ROTATIONAL PROPERTIES OF URANUS AND NEPTUNE
Michael J. S. Belton (Kitt Peak National Observatory, Tucson, Ariz.) and Richard Terrile *In its* Uranus and Neptune Oct. 1984 p 327-347 refs Sponsored in part by NSF (For primary document see N85-11927 02-91)
Avail: NTIS HC A02/MF A01; SOD HC CSCL 03B

An assessment of recent research bearing on the rotational properties of Uranus and Neptune is given. It is concluded that these properties are best described by the following estimates; URANUS: Direction of pole = alpha (1950) = 256:72 delta (1950) = -15:04 with an absolute uncertainty of about 0:2, Period = 15 to 17 hours; Sense of spin = Retrograde; NEPTUNE: alpha (1950) = 297:8; delta (1950) = + 41:2, with an uncertainty of about 4 degrees towards the pole of Triton's orbit, Period = 18.2 + or - 0.4 hours, Sense of spin = Prograde. There is a

clear signature of large scale, zonal, atmospheric flows in observations of the atmosphere of Neptune. Wind velocities are at least as great as 109 m.sec-1. There is no evidence pro or con for atmospheric motions in the Uranus case. Author

N85-11941*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric, and Planetary Sciences.
OBLATENESSES OF URANUS AND NEPTUNE
Richard G. French *In* JPL Uranus and Neptune Oct. 1984 p 349-255 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The oblateness of a planet is closely related to its rotation rate and internal mass distribution, and is therefore an important indicator of gross planetary structure. Analysis of Stratoscope II images of Uranus yields epsilon = 0.022 + or - 0.001, and stellar occultation observations yield epsilon = 0.024 + or - 0.003. Because of the current pole on aspect of Uranus, it is unlikely that a significantly more accurate value can be determined by stellar occultations before Voyager 2 encounters Uranus in January, 1986. Neptune's oblateness has been determined from stellar occultation observations made in 1968 and 1983. The 1968 observations yield an oblateness of 0.021 + or - 0.004. A recent determination of Neptune's oblateness using both the 1968 and 1983 observations is consistent with this value. Space Telescope observations of several stellar occultations by Neptune could provide a significantly more accurate determination of the oblateness before the Voyager 2 encounter in 1990. Author

N85-11942*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHYSICAL PROPERTIES OF NEPTUNE AND TRITON INFERRED FROM THE ORBIT OF TRITON
A. W. Harris *In its* Uranus and Neptune Oct. 1984 p 357-373 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The orbital motion of Triton was redetermined from photographic data spanning the interval 1899-1981. The resulting ephemeris should provide Triton positions with respect to Neptune with an accuracy of plus or minus 500 km through the end of the century. The following physical results follow from the orbit solution. The inverse mass of Neptune + Triton is solar mass over (c sub N + m sub T) = 19490 plus or minus 40. No acceleration of the mean motion nor orbital eccentricity were detected, thus constraining the tidal dissipation factors of Neptune and Triton to O sub N less than or equal to 650 and QT less than or equal to 10,000. Tidal heating of Triton is presently insignificant. The gravitational harmonic J sub 2 of Neptune is 0.0043 plus or minus 0.0003 if Triton is as massive as m sub T/ M sub N = 0.00128, and if Neptune's spin is prograde with P approximately 18(h), or J sub 2 = 0.0037 plus or minus 0.0002 if Triton is much less massive. Triton undergoes extreme climatic variations due to the combined motion of it's orbit plane and Neptune's orbital motion. Approximately 10% of Triton's surface is presently hidden from diurnal insolation, which may provide a powerful cold trap for atmospheric voltatiles. R.J.F.

N85-11943*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
ORIGIN AND EVOLUTION OF THE URANIAN AND NEPTUNIAN SATELLITES: SOME DYNAMICAL CONSIDERATIONS
Stanley F. Dermott *In* JPL Uranus and Neptune Oct. 1984 p 377-404 refs (For primary document see N85-11927 02-91) (Grant NAGw-392)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The satellite system of Neptune is so irregular that some formation mechanism or subsequent dynamical evolution that sets it apart from the other, more regular, satellite systems is obviously indicated. McKinnon argued that satellite capture is the most likely possibility and has shown that tidal circularization of Triton's presumably highly eccentric initial orbit probably resulted in melting of the satellite's interior. The satellite system of Uranus, although somewhat bland, also has a number of special features that indicate an interesting dynamical history. These include the anomalously high orbital inclination of Miranda and the probable coexistence of small satellites and narrow rings inside the plant's Roche limit. The possibility that orbital evolution due to tidal dissipation is involved in both of these phenomena is discussed. Other topics discussed are: the origin of rings; the formation of coorbital satellites; the lack of stable orbit-orbit resonances in the Uranian satellite system; and chaos, tidal heating and the shapes of Miranda and Ariel. R.J.F.

N85-11944*# California Inst. of Tech., Pasadena. Geological and Planetary Sciences Div.
COMPOSITION, STRUCTURE AND EVOLUTION OF URANIAN AND NEPTUNIAN SATELLITES
David J. Stevenson *In* JPL Uranus and Neptune Oct. 1984 p 405-423 refs (For primary document see N85-11927 02-91) (Grant NAGw-450)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Large uncertainties in the current estimated densities of all of these satellites prevent detailed modeling or predictions. Nevertheless, current evidence suggests that at least Titania and Oberon might have anomalously high densities of 2-39 cm(-3), possibly requiring almost ice-free hydrated silicates or formation in a CO-rich environment, implying presence of CO-clathrate and a small ice/rock ratio. Tritton and the four largest satellites of Uranus are massive enough to have undergone significant accretional heating and early differentiation; NH3-H2O volcanism; partial outgassing of CO, N2, Ch4; formation of dark surficial deposits of carbon-rich material obtained by UV irradiation of outgassed material; and, at least in the cases of Ariel and Triton, a possibility of weak ongoing icy volcanic activity. Triton may be the largest captured body in the solar system, with an unusual history and composition, including the possibility of substantial liquid or solid nitrogen obtained from either primordial NH3 photolysis or clathrate decomposition. Author

N85-11945*# Hawaii Univ., Honolulu. Inst. for Astronomy.
PHYSICAL PROPERTIES OF THE SATELLITES OF NEPTUNE
Dale P. Cruikshank *In* JPL Uranus and Neptune Oct. 1984 p 425-436 refs (For primary document see N85-11927 02-91) (Grant NGL-12-001-057)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Spectrophotometric studies of Triton suggest a surface covered in part by solid methane. Nitrogen is suspected on the basis of a single spectral band, but this material, if present, must be in a condensed state. Liquid nitrogen covering part of Triton to a depth of a few tens of centimeter can satisfy the spectral data so far available. If condensed nitrogen occurs on Triton, the satellite has an atmosphere largely of N2 (pressure approximately 0.1 bar), with CH4 as a minor constituent. The reddish hue of Triton's surface may result from photochemical derivatives of the methane and nitrogen, as in the case of Titan. The radius of Triton has been determined by indirect means to be 1750 km, but there may be a large systemmatic error in this value. If the mean density is approximately 2-3 g/cubic cm. the mass derived from astrometric observations is in error. There is no information on physical properties of Nereid. A third suspected satellite was not confirmed. R.J.F.

N85-11946*# Hawaii Univ., Honolulu. Planetary Geosciences Div.
PHYSICAL PROPERTIES OF THE URANIAN SATELLITES
Robert Hamilton Brown *In* JPL Uranus and Neptune Oct. 1984 p 437-461 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Recent work on the satellites of Uranus revealed many of their basic physical properties. Radiometric measurements showed that the Ariel, Umbriel, Titania and Oberon have diameters which range from 1630 to 1110 km and albedos which range from 0.30 to 0.18. Spectrophotometric observations of Miranda suggest that it may have the highest albedo of the known Uranian satellites and a diameter of about 500 km. Near-infrared measurements show that Ariel, Titania and Oberon have the largest known opposition surges. All five known satellites of Uranus have surfaces

which are composed of water ice contaminated with small amounts of dark material. The dark material on the surfaces of Ariel, Umbriel, Titania and Oberon is spectrally bland and has spectral similarities to carbon black, charcoal, carbonaceous chondritic material and other dark, spectrally neutral materials. Recent density determinations suggest that there may be large density differences among Ariel, Umbriel, Titania and Oberon, with density increasing with distance from Uranus. R.J.F.

N85-11947*# Planetary Science Inst., Tucson, Ariz.
SATELLITE MASSES IN THE URANUS AND NEPTUNE SYSTEMS
Richard Greenberg *In* JPL Uranus and Neptune Oct. 1984 p 463-480 refs (For primary document see N85-11927 02-91)
(Contract NASw-3134)
(PSI-Contrib-198) Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Satellite masses are derivation with emphasis on implications for bulk densities and albedos is reviewed. In the Uranian system the inner satellites have lower densities and/or higher albedos than the outer ones. However, uncertainties are great enough that all five satellites may have nearly equal densities. In such a case the albedo would decrease with semimajor axis. A more severe constraint is placed on Miranda's mass, and hence on its density and albedo. The recent radiometric value for Triton's diameter, combined with mass determinations, yields a density greater than 4 gm/cu cm. E.A.K.

N85-11948*# McDonald Observatory, Austin, Tex.
SEASONAL VARIATIONS IN TRITON'S ATMOSPHERIC MASS AND COMPOSITION
L. M. Trafton *In* JPL Uranus and Neptune Oct. 1984 p 481-493 refs (For primary document see N85-11927 02-91)
(Grant NGL-44-012-152)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Condensed phases of gases which make up the bulk of Triton's atmosphere are likely to exist on Triton's surface in the form of solid or liquid polar caps which extend as far as 55 deg from the poles. The mass of Triton's atmosphere is governed by the energy balance between the sunlight these caps absorb and the heat they radiate to space. The polar cap temperatures should be approximately equal and uniform over their surfaces. Because of the rapid precession of Triton's orbit about Neptune's pole, the insolation and, therefore, the temperature of the polar caps must vary in a complex fashion. The variations in the temperature of the polar caps will also cause seasonal variations in the mixing ratio of the volatile atmospheric gases owing to the different behaviors of their saturation vapor pressures with temperature. Triton's visible hemisphere is approaching a major southern summer with solstices. If the polar caps are not too thin a dramatic increase in the CH4 column abundance would occur. E.A.K.

N85-11949*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
MAGNETOSPHERIC STRUCTURES: URANUS AND NEPTUNE
T. W. Hill *In* JPL Uranus and Neptune Oct. 1984 p 497-525 refs (For primary document see N85-11927 02-91)
(Grants NAGw-168; NSF ATM-83-11146)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Magnetospheric structures that might be encountered at Uranus and Neptune are described. Statistics indicate a sufficiently high probability to warrant consideration of their likely properties in advance of the Voyager encounters. Because the spin axis of Uranus lies nearly in the ecliptic and presently points approximately sunward, Voyager is likely to encounter the unique pole on configuration that has special theoretical significance. Corotation in the magnetospheres of Uranus and Neptune would probably exclude solar wind drive convection as an important driver of global magnetospheric dynamics, as it does at Jupiter and Saturn. The magnetospheres of Uranus and Neptune probably lack sufficient internal sources of plasma to produce significant levels of rotationally driven convection. The reported observation of auroral emission from Uranus has therefore motivated the development of an alternative model in which solar wind motion is coupled directly to the rotation of the ionosphere to establish a dynamo circuit which generates Birkeland currents and polar cap aurora. This model predicts the strength and configuration of the aurora as functions of the magnitude and polarity, respectively, of the planetary magnetic moment. E.A.K.

N85-11950*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SOLAR WIND AT 20-30 AU **c92**
Aaron Barnes and Paul R. Gazis *In* JPL Uranus and Neptune Oct. 1984 p 527-540 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Pioneer 10 sampled the interplanetary plasma over the range 20 to 30 astronomical units, during the period 1979-1983. The median flow speed is about 400 km/s, and at 20 AU the median density, proton temperature and dynamic pressure are, respectively, 0.025 cm-3, 10(4) K, and 6x10-11 dyne cm-2. It is shown that the average solar wind flow speed does not vary significantly with increasing heliocentric distance, and the density falls off as R-2, as predicted by simple solar wind models. The day-to-day variations in solar wind parameters are smaller at larger distance. Very large shocks however, were detected beyond 25 AU. Comparison of Pioneer 10 and 11 observations at similar distances but different phases of the solar activity cycle shows that solar wind dynamic pressure varies over a wider range during epochs of high solar activity. The variation near 20 AU is likely to be smaller at Voyager 2 Uranus encounter than observed by Pioneer 10 in the 1979-80 period. E.A.K.

N85-11951*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
MAGNETOSPHERE, RINGS, AND MOONS OF URANUS
Andrew F. Cheng *In* JPL Uranus and Neptune Oct. 1984 p 541-556 refs (For primary document see N85-11927 02-91)
(Contract N00024-78-C-5384)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The observation of an ultraviolet aurora on Uranus implies the existence of a magnetosphere. It is suggested that the magnetospheres of Uranus and Saturn may be very similar. Charged particle sputtering of water ice surfaces on the Uranian moons may maintain an oxygen ion plasma torus similar to the heavy ion plasma torus at Saturn. Atmospheric cosmic ray albedo neutron decay may sustain an inner radiation belt with omnidirectional proton fluxes. If the 100 keV ion fluxes near 7 RU are similar to Saturnian ion fluxes at such energies, the Uranian aurora may be maintained by ion precipitation from the radiation belts at nearly the strong diffusion rate. This mechanism predicts comparable aurorae over both magnetic poles of Uranus, in contrast with the Faraday disc dynamo mechanism, which powers an aurora only over the sunlit pole of uranus. If, however, the 100 kev ion fluxes at Uranus are comparable to those at Saturn, any exposed methane ice surfaces on the moons and rings of Uranus would be quickly transformed by ion impacts to a black, carbonaceous polymer. E.A.K.

N85-11952*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
DO THE SATELLITES OF URANUS CONTROL ITS MAGNETOSPHERE?
Andrew F. Cheng and T. W. Hill (Rice Univ., Houston, Tex.) *In* JPL Uranus and Neptune Oct. 1984 p 557-558 (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The importance of the satellites of Uranus as sources of magnetospheric plasma were investigated. It is found that neither an Io like plasma source nor a Titan like source is likely at Uranus. The likely presence of a heavy ion plasma torus maintained by charged particle sputtering of the icy satellites is examined. Sputtering of Saturn's icy satellites is considered an important source of heavy ion (oxygen) plasma in Saturn's inner magnetosphere. A major unresolved question is whether this sputtering

process does depend on the preexistence of magnetospheric heavy ions derived from another source, Titian. E.A.K.

N85-11953*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
LYMAN-ALPHA AURORA
Samuel T. Durrance and John T. Clarke (California Univ., Berkeley) *In* JPL Uranus and Neptune Oct. 1984 p 559-572 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The existence of intense and variable H Ly a emission from Uranus is demonstrated utilizing the monochromatic imaging capabilities of the International Ultraviolet Explorer satellite. A series of 14 observations, using the IUE short wavelength spectrograph in low dispersion and covering the period from 3 March 1982 through 2 September 1983, shows the disk averaged Ly a brightness of Uranus to vary between 690 and 2230 Rayleighs. Model calculations indicates that < 400 R of this emission can be attributed to resonant scattering of solar Ly a radiation. An upper limit of 100 R is obtained for the Raman scattering of solar Ly a by H2 (1280 A). This implies that < 300 R is contributed to the planetary Ly a emission by Rayleigh scattering. In addition to being unexpectedly strong, the Uranian Ly a emission has been observed to vary by a factor of two in one 24 hr period and by about 50% in one 5 hr period. B.W.

N85-11954*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric, and Planetary Sciences.
THE STRUCTURE OF THE URANIAN RINGS AND THE SEARCH FOR RINGS AROUND NEPTUNE
James L. Elliot *In* JPL Uranus and Neptune Oct. 1984 p 575-588 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

The nine narrow rings of Uranus, presently the only confirmed features of this system, have been observed with the diffraction-limited resolution (3.5 km) of ground-based occultations since their discovery in 1977. These data have been used to establish an orbit model, from which the five Keplerian orbit parameters for each ring, the pole of the mean ring plane, and the gravitational harmonic coefficients J sub 2 and J sub 4 have been determined. The rings are typically a few kilometers wide with eccentricities of about 0.001 and inclinations of a few hundredths of a degree, although a few have no measurable eccentricity or inclination. Interesting Voyager investigations would include probing the structure of the rings at higher spatial resolution, searching for new rings in the system (including inter-ring material), locating the postulated shepherd satellites, and searching for satellites inside the orbit of Miranda that might have dynamical influence on the rings. The high precision (approx 2 km) of the ring orbits might prove useful for spacecraft navigation. For Neptune, occultation searches have revealed no rings to a limit of a few hundreths optical depth, within a few hundred kilometers from the top of the planet's atmosphere (for equatorial rings). Author

N85-11955*# Cornell Univ., Ithaca, N.Y.
INFRARED IMAGES OF THE URANIAN RINGS
Philip D. Nicholson *In* JPL Uranus and Neptune Oct. 1984 p 589-608 refs Sponsored in part by NASA (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Images of the Uranian rings at a wavelength of 2.2 micrometers, chosen to reduce the problem of scattered light from the planet, have been acquired on several occasions spanning the period 1978-1983. Although individual rings are not resolved in these images, the integrated brightness of the system is observed to vary with azimuth. The phase and amplitude of this variation is found to be consistent with the precession rate and variable width of the epsilon ring, as deduced from stellar occultation data. Quantitative analyses of the brightness variations permit an upper limit of approx. 0.0015 to be pladed on the average normal optical depth of any diffuse inter-ring material. Preliminary absolute calibration of the 1983 data yields an average ring geometric albedo, at 2.2 micrometers, of 0.22 + or - 0.002, consistent with previous estimates. Lastly, the potential use of near-infrared images in searches for faint inner satellites of Uranus is discussed. Author

N85-11956*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
DYNAMICS OF THE URANIAN RINGS
Stanley F. Dermott *In* JPL Uranus and Neptune Oct. 1984 p 609-627 refs (For primary document see N85-11927 02-91)
(Grant NAGw-392)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

Some of the problems of the shepherding satellite model of Goldreich ant tremaine are discussed. The following topics are studied: (1) optical depths of the all the observed narrow rings; (2) satellite and ring separation timescales; (3) ring edge sharpness; (4) shock formation in narrow rings; (5) the existence of small satellites near the Uranian rings; and (6) the apse and node alignments of the eccentric and inclined rings. B.W.

N85-11957*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MARS-EARTH GEOGRAPHICAL COMPARISONS: A PICTORIAL VIEW
Stephen Paul Meszaros Oct. 1984 38 p refs
(NASA-TM-86166; NAS 1.15:86166) Avail: NTIS HC A03/MF A01 CSCL 03B

A collection of pictorial comparisons of prominent physiographic features found on Mars and Earth, consisting of equal-scale side-by-side pairs or cartographic overlays is presented. Martian features compared with terrestrial ones include Vales Marineris, the Tharsis bulge, Olympus Mons, the Hellas and Argyre basins, areas of catastrophic flooding, and the polar regions. The illustrations are accompanied by a brief descriptive text and bibliography. Author

N85-11958*# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
HIGH PRESSURE COSMOCHEMISTRY APPLIED TO MAJOR PLANETARY INTERIORS: EXPERIMENTAL STUDIES Status Report
Malcolm F. Nicol, Mary Johnson, and Andrea S. Koumvakalis 1 Nov. 1984 12 p refs
(Grant NAGw-104)
(NASA-CR-174032; NAS 1.26:174032) Avail: NTIS HC A02/MF A01 CSCL 03B

Progress is reported on a project to determine the properties and boundaries of high pressure phases of the H2-He-H2O-NH3-CH4 system that are needed to constrain theoretical models of the interiors of the major planets. This project is one of the first attempts to measure phase equilibria in binary fluid-solid systems in diamond anvil cells. Vibrational spectroscopy, direct visual observations, and X-ray diffraction crystallography of materials confined in externally heated cells are the primary experimental probes. Adiabats of these materials are also measured in order to constrain models of heat flow in these bodies and to detect phase transitions by thermal anomalies. Initial efforts involve the NH3-H2O binary. This system is especially relevant to models for surface reconstruction of the icy satellites of Jupiter and Saturn. Thermal analysis experiments were completed for the P-X space, p<4GPa: 0< or = 0.50, near room temperature. The cryostat, sample handling equipment, and optics needed to extend the optical P-T-X work below room temperature was completed. M.G.

N85-11959*# University of Southern California, Los Angeles. Center for Earth Sciences.
THE RHEOLOGY OF ICY SATELLITES Final Technical Report
Charles G. Sammis Oct. 1984 9 p
(Grant NAGw-43)
(NASA-CR-174024; NAS 1.26:174024; USC-TR-84-9) Avail: NTIS HC A02/MF A01 CSCL 03B

High-temperature creep in orthoenstatite under conditions of controlled oxygen fugacity was studied. It was found that creep was conttrolled by the extremely thin layer of SiO2 which wetted the grain boundaries. Slight reduction of the (Mg, Fe)SiO3 enstatite

during hot pressing produced microscopic particles of Fe and the thin film of intergranular SiO2. This result highlights another complication in determining the flow properties of iron bearing silicates which constitute the bulk of terrestrial planets and moons. The Phenomenon may be important in the ductile formation of any extraterrestrial body which is formed in a reducing environment. The rheology of dirty ice was studied. This involves micromechanical modeling of hardening phenomena due to contamination by a cosmic distribution of silicate particles. The larger particles are modeled by suspension theory. In order to handle the distribution of particles sizes, the hardening is readed as a critical phenomenon, and real space renormalization group techniques are used. Smaller particles interact directly with the dislocations. The particulate hardening effect was studied in metals. The magnitude of such hardening in ice and the defect chemistry of ice are studied to assess the effects of chemical contamination by methane, ammonia, or other likely contaminants. E.A.K.

N85-11960*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
LABORATORY EVALUATION OF MICROWAVE ABSORPTION PROPERTIES UNDER SIMULATED CONDITIONS FOR PLANETARY ATMOSPHERES Annual Status Report, 1 Feb. 1984 - 31 Jan. 1985
Paul G. Steffes 1984 24 p refs
(Grant NAGw-533)
(NASA-CR-174060; NAS 1.26:174060) Avail: NTIS HC A02/MF A01 CSCL 03B

The microwave absorbing properties of gaseous sulfuric acid (H2SO4) under Venus atmospheric conditions are investigated. The results are applied to measurements from Mariner 5, Mariner 10, and Pioneer/Venus Radio Occultation experiments, to determine abundancies of gaseous sulfuric acid in the Venus atmosphere. The microwave properties of the vapors accompanying liquid H2SO4 are studied to estimate the vapor pressure in an atmospheric model. M.A.C.

N85-11961*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MARS EXPLORATION, VENUS SWINGBY AND CONJUNCTION CLASS MISSION MODES, TIME PERIOD 2000 TO 2045
Archie C. Young, John A. Mulqueen, and James E. Skinner 31 Aug. 1984 82 p refs
(NASA-TM-86477; NAS 1.15:86477) Avail: NTIS HC A05/MF A01 CSCL 03B

Trajectory and mission requirement data are presented for Earth-Mars opposition class and conjunction class round trip stopover mission opportunities available during the time period year 2000 to year 2045. The opposition class mission employs the gravitational field of Venus to accelerate the space vehicle on either the outbound or inbound leg. The gravitational field of Venus was used to reduce the propulsion requirement associated with the opposition class mission. Representative space vehicle systems are sized to compare the initial mass required in low Earth orbit of one mission opportunity with another mission opportunity. The interplanetary space vehicle is made up of the spacecraft and the space vehicle acceleration system. The space vehicle acceleration system consists of three propulsion stages. The first propulsion stage performs the Earth escape maneuver; the second stage brakes the spacecraft and Earth braking stage into the Mars elliptical orbit and effects the escape maneuver from the Mars elliptical orbit. The third propulsion stage brakes the mission module into an elliptical orbit at Earth return. The interplanetary space vehicle was assumed to be assembled in and depart from the space station circular orbit. Author

N85-11090# Joint Publications Research Service, Arlington, Va.
PHYSICAL AND MECHANICAL PROPERTIES OF LUNAR SOIL AS FUNCTION OF SPECIFICS OF RELIEF AND PROCESSES IN VICINITY OF OPERATION OF LUNOKHOD-2 Abstract Only
A. T. Bazilevskiy, N. N. Grebennik, V. V. Gromov, A. D. Dmitriyev, A. L. Kemurdzhian, V. P. Polosukhin, P. S. Semenov, and K. P. Florenskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 65-66 Transl. into ENGLISH from Kosmicheskiye Issled. (Moscow), v. 22, no. 2, Mar.-Apr. 1984 p. 243-251 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11100# Joint Publications Research Service, Arlington, Va.
TWO-LEVEL MODEL FOR FORMATION OF NIGHT IONOSPHERE OF VENUS FROM RADIO OCCULATION EXPERIMENTS Abstract Only
I. K. Osmolovskiy, N. A. Savich, and L. N. Samoznayev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 76 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 276, no. 2, May 1984 p 325-328 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11101# Joint Publications Research Service, Arlington, Va.
INFRARED THERMAL RADIATION OF VENUS Abstract Only
L. V. Ksanfomaliti *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Jan. 1984 p 77 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 252-266 Original language document announced as A84-34087 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07/MF A01

N85-11102# Joint Publications Research Service, Arlington, Va.
H2O PROFILE IN LOWER ATMOSPHERE OF VENUS BASED ON EFFECTIVE RADIATION FLUX MEASUREMENTS Abstract Only
M. Ya. Marov, A. P. Galtsev, and V. P. Shari *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 77 Transl. into ENGLISH from Kosm. Issled., v. 22, no. 2, Mar. - Apr. 1984 p 267-272 Original language document announced as A84-34088 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11103# Joint Publications Research Service, Arlington, Va.
CHANGE IN VENUSIAN ATMOSPHERE ABSORPTION COEFFICIENT WITH ALTITUDE Abstract Only
E. G. Yanovitskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 78 refs Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 273-278 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11104# Joint Publications Research Service, Arlington, Va.
THEORETICAL STUDY OF ELECTRON CONCENTRATION IN VENUSIAN ATMOSPHERE AS FUNCTION OF ZENITH ANGLE OF SUN AND SOLAR ACTIVITY IN AREAS OF PHOTOCHEMICAL EQUILIBRIUM Abstract Only
A. V. Pavlov *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 78 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 279-291 Original language document announced as A84-34090 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11105# Joint Publications Research Service, Arlington, Va.
FORBIDDEN LINES OF OXYGEN IN COMET SPECTRA Abstract Only
V. A. Krasnopolskiy *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 79 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2 Mar. - Apr. 1984 p 292-296 Original language document announced as A84-34091 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-11962 North Carolina Univ., Chapel Hill.
ENERGETIC ELECTRONS IN IMPULSIVE SOLAR FLARES

Ph.D. Thesis
David Allen Batchelor 1984 175 p
Avail: Univ. Microfilms Order No. DA8415789

Impulsive bursts of hard X-rays and microwaves are observed during most solar flares, and both emissions are attributed to a common distribution of source electrons with energies from approximately 10 keV to several hundred keV. A detailed account of the evolution of the electron distribution is crucial to a complete description of the energy release process in flares. An analysis is made of a thermal flare model proposed by Brown, Melrose, and Spicer (1979) and Smith and Lilliequist (1979). They assumed the source of impulsive hard X-rays to be a plasma at a temperature of approximately 10 to the 8th power K, initially located at the apex of a coronal arch, and confined by ion-acoustic turbulence in a collisionless conduction front. The X-ray observations were obtained with the Hard X-ray Burst Spectrometer on board the Solar Maximum Mission spacecraft, and the microwave observations were obtained from the Bern Radio Observatory in Switzerland. The results are in good agreement with the model and are not explained by any other flare models which were considered.
Dissert. Abstr.

N85-11963*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
STUDY OF THE SOLAR CORONA USING RADIO AND SPACE OBSERVATIONS Annual Status Report, Nov. 1983 - Oct. 1984
George A. Dulk Oct. 1984 37 p refs
(Grant NsG-7287)
(NASA-CR-174034; NAS 1.26:174034) Avail: NTIS HC A03/MF A01 CSCL 03B

The physics of coronal transients, the characteristics of radiation and accelerated particles at the time of flares, and the density/temperature structure of the transition region and corona and the coronal magnetic field are investigated. M.A.C.

N85-11964*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
PHYSICS OF THE INNER HELIOSPHERE 1-1OR0 PLASMA DIAGNOSTICS AND MODELS Semiannual Progress Report, 1 May - 31 Oct. 1984
George L. Withbroe Nov. 1984 11 p refs
(Grant NAGw-249)
(NASA-CR-174010; NAS 1.26:174010; SAPR-6) Avail: NTIS HC A02/MF A01 CSCL 03B

The physics of solar wind flow in the acceleration region and impulsive phenomena in the solar corona is studied. The study of magnetohydrodynamic wave propagation in the corona and the solutions for steady state and time dependent solar wind equations gives insights concerning the physics of the solar wind acceleration region, plasma heating and plasma acceleration processes and the formation of shocks. Also studied is the development of techniques for placing constraints on the mechanisms responsible for coronal heating. E.R.

N85-11965*# Alabama Univ., Huntsville.
ACTIVE REGIONS Final Report
S. T. Wu Sep. 1984 4 p
(Contract NAS8-33525)
(NASA-CR-170628; NAS 1.26:170628; UAH-31-7258) Avail: NTIS HC A02/MF A01 CSCL 03B

The following efforts were completed in support of the Solar Maximum Mission (SMM): (1) the evolution of solar vector photospheric magnetic fields in a flare-producing active region was studied; (2) an algorithm was developed to generate maps of force-free magnetic field strengths at varying heights in the solar atmosphere; and (3) the study of the physical state of the material confined along entire magnetic loops was advanced with the use of magnetic field extrapolation. R.S.F.

N85-11966# Los Alamos Scientific Lab., N. Mex.
SOLAR NEUTRINOS: PROSPECTS FOR DETECTION AND IMPLICATIONS
W. C. Haxton 1984 16 p refs Presented at 11th Intern. Conf. on Neutrino Phys. and Astrophys., Dortmund, West Germany, 11 Jun. 1984
(Contract W-7405-eng-36)
(DE84-015522; LA-UR-84-2339; CONF-8406182-1) Avail: NTIS HC A02/MF A01

From the viewpoint of particle physics, the Sun provides us with a high intensity (approx. 10(11)/cm(2)sec) source of neutrinos that have traveled over an interesting distance. An opportunity to mount incomparable neutrino oscillation experiments would be missed if not exploited. From the distribution, a precise record of the thermonuclear reactions that occur in the sun's high-temperature core. A unique, quantitative test of theories of stellar evolution is provided, and thus one of the fundamental clocks that monitor the aging of the universe. This information cannot be obtained from conventional observations of the radiation emitted from cool stellar surfaces: solar photons have lost, in their 10(7) year journey outward from the core, all detailed memory of the mechanisms by which they were created. The feasibility, by virtue of several very recent advances in nuclear physics and nuclear chemistry, of a complete program of solor neutrino spectroscopy that will quantitatively test both the standard stellar model and the behavior of low-energy netrinos over astrophysical distances is examined. DOE

N85-11967# Los Alamos Scientific Lab., N. Mex. Inertial Fusion and Plasma Theory.
REVIEW OF SIMULATION OF QUASIPARALLEL COLLISIONLESS SHOCKS
Kevin B. Quest 1984 41 p refs Presented at the Chapman Conf. on Collisionless Shock Waves in the Heliosphere, Napa Valley, Calif., 20 Feb. 1984
(Contract W-7405-eng-36)
(DE84-015489; LA-UR-84-2140; CONF-840256-5) Avail: NTIS HC A03/MF A01

Progress in the numerical simulation of quasiparallel shocks is reviewed. Recent work on one-dimensional hybrid codes (fluid electrons, particle ions) and two-dimensional particle codes is emphasized. Basic goals and limitations of the various models are stated. DOE

N85-11968# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
SOLAR NEUTRINO SPECTROSCOPY
W. C. Haxton 1984 12 p refs Presented at the Conf. on the Intersection Between Particle and Nucl. Phys., Steamboat Springs, Colo., 23-30 May 1984
(Contract W-7405-eng-36)
(DE84-015518; LA-UR-84-2338; CONF-8405193-33) Avail: NTIS HC A02/MF A01

The nuclear physics, particle physics, and astrophysics motivations for completin a program of solar neutrino spectroscopy are reviewed. Such a program would quantitively test both the standard stellar model and the behavior of low-energy neutrinos over astrophyical distances. DOE

N85-11969# Brookhaven National Lab., Upton, N. Y.
CHLORINE AND BROMINE SOLAR NEUTRINO EXPERIMENTS
B. Cleveland, R. Davis, Jr., and J. K. Rowley 1984 10 p refs Presented at 2nd Symp. on Resonance Ionization Spectroscop. and its Appl., Knoxville, Tenn., 16 Apr. 1984
(DE84-015720; BNL-35021; CONF-840449-12) Avail: NTIS HC A02/MF A01

The Sun is generally believed to be generating energy by a set of hydrogen fusion reactions that are occurring in its deep interior. These exothermic reactions serve to convert hydrogen into helium emitting energy in the form of positrons, neutrinos, gamma radiation, and kinetic energy. These processes can be investigated directly by studying the spectrum of neutrinos. The neutrino has the unique property of penetrating the Sun without

loss of energy and therefore can be used to observe the energy generation process in the interior of the Sun. The results of these studies are important in understanding the structure and evolution of the Sun and stars in general. DOE

N85-11095# Joint Publications Research Service, Arlington, Va.
STATISTICAL ANALYSIS OF 11-YEAR AND 80-YEAR SOLAR CYCLES Abstract Only
M. Biyelekova *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 68-69 Transl. into ENGLISH from Astron. Z. (Moscow), v. 61, no. 1, Jan. - Feb. 1984 p 163-169 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11099# Joint Publications Research Service, Arlington, Va.
SOLAR FLARES AND LABORATORY EXPERIMENTS ON MAGNETIC RECONNECTION IN CURRENT SHEATHS Abstract Only
S. V. Bulanov, V. A. Dogel, and A. G. Frank *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 72 Transl. into ENGLISH from Pisma V Astron. Z. (Moscow), v. 10, no. 2, Feb. 1984 p 149-153 Document previously announced as A84-43998 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11950*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SOLAR WIND AT 20-30 AU
Aaron Barnes and Paul R. Gazis *In* JPL Uranus and Neptune Oct. 1984 p 527-540 refs (For primary document see N85-11927 02-91)
Avail: NTIS HC A99/MF A01; SOD HC CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-11970# Rome Univ. (Italy). Ist. di Fisica G. Marconi.
ANOMALON SEARCH
G. Baroni, A. M. Cecchetti, S. DiLiberto, A. Manfredini, F. Meddi, G. Romano, and C. Sgarbi 15 Jun. 1984 19 p refs
(Nota-Interna-825) Avail: NTIS HC A02/MF A01

An anomalon search using 3000 fragments produced by interaction in emulsion of Fe nuclei of 1.9 A GeV is described. Fragment paths behavior is compatible with normal mean free path values of their components. The existence of a sample of fragments, with common features, responsible for an anomalon effect was investigated. There is a weak indication of an effect among the fragments produced in association with other fragments, but data on the normal situation of stable nuclei in emulsion are needed to enable conclusions to be drawn. Author (ESA)

N85-11092# Joint Publications Research Service, Arlington, Va.
VARIATION OF FAST CHARGED PARTICLES IN EVENT OF 22 NOVEMBER 1977 BASED ON COSMOS-900 SATELLITE DATA Abstract Only
Ye. V. Gorchakov, V. A. Iozenas, M. V. Ternovskaya, V. G. Afanasyev, and P. P. Ignatyev *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 67 Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 22, no. 2, Mar. - Apr. 1984 p 312-315 Original language document announced as A84-34095 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

N85-11098# Joint Publications Research Service, Arlington, Va.
OBSERVATION OF GAMMA RADIATION FROM CRAB NEBULA IN 5-100 MeV RANGE Abstract Only
A. F. Iyudin, V. G. Kirillov-Ugrymov, Yu. D. Kotov, Yu. V. Smirnov, V. N. Yurov, L. V. Kurnosova, M. I. Fradkin, S. V. Damle, G. S. Gokhale, P. K. Kunte et al *In its* USSR Rept.: Space (JPRS-USP-84-005) 26 Oct. 1984 p 71 refs Transl. into ENGLISH from Pisma V Astron. Z. (Moscow), v. 10, no. 2, Feb. 1984 p 100-104 (For primary document see N85-11060 02-12)
Avail: NTIS HC A07

99 GENERAL

N85-11971# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD BULLETIN TECHNICAL PROGRAMME, 1985
Loughton, England Aug. 1984 38 p
(AGARD-BUL-84-2) Copyright. Avail: NTIS HC A03/MF A01

The 1985 program approved by the AGARD National Delegates Board is presented. A chronological listing of the meetings tentatively scheduled to take place during 1985 are included. A detailed description of the Individual Panel Programs, the Consultant and Exchange Program, and the Military Committee Studies Program is given. The total budget required to support the proposed programs is presented. The AGARD publications scheduled for publication in 1985 are identified. B.G.

N85-11972# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD HIGHLIGHTS
Sep. 1984 34 p In ENGLISH and FRENCH
(AGARD-Highlights-84/2) Avail: NTIS HC A03/MF A01

The mission of AGARD which is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace is discussed. The purposes of AGARD are to: (1) exchange scientific and technical information; (2) continuously stimulate advances in the aerospace sciences relevant to strengthening the common defence posture; (3) improve the cooperation among member nations in aerospace research and development; (4) provide scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development; (5) render scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field; (6) provide assistance to member nations for the purpose of increasing their scientific and technical potential; (7) recommend effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community. Topics include: the role of AGARD in the NATO planning process; trends in guidance and control; large scale computing in aeronautics. E.A.K.

N85-11973*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH AND TECHNOLOGY Annual Report, 1984
Washington Nov. 1984 110 p
(NASA-TM-86321; NAS 1.15:86321) Avail: NTIS HC A06/MF A01 CSCL 05B

The role of the Langley Research Center is to engage in the basic and applied research necessary for the advancement of aeronautics and space flight, to enerate new and advanced concepts for the accomplishment of related national goals, and to provide research advice, technological support, and assistance to other NASA installations, other government agencies, and industry. Highlights of the major accomplishments and applications made during the past year are described. The highlights illustrate both the broad range of the research and technology activities at the Langley Research Center and the contributions of this work toward maintaining United States leadership in aeronautics and space research. M.A.C.

N85-11974# Office of Naval Research Liason Office, Far East, APO, San Francisco, Calif.
ONR (OFFICE OF NAVAL RESEARCH) FAR EAST SCIENTIFIC

BULLETIN, VOLUME 9, NUMBER 2, APRIL - JUNE 1984
S. Yamamoto and M. L. Moore Jun. 1984 190 p
(AD-A145681) Avail: NTIS HC A09/MF A01 CSCL 05/2

This is a quarterly publication presenting articles covering recent developments in Far Eastern (particularly Japanese) scientific research. It is hoped that these reports (which do not constitute part of the scientific literature) will prove to be of value to scientists by providing items of interest well in advance of the usual scientific publications. The articles are written primarily by members of the staff of ONR Far East and the Air Force Office of Scientific Research with certain reports also being contributed by visiting stateside scientists. Occasionally a regional scientist will be invited to summit an article covering his own work, considered to be of special interest. Articles cover marine science, technology, physics, fiber optics, Computers, lasers, steelmaking, etc. GRA

N85-11975# Vermont Univ., Burlington.
EUROPEAN SCIENTIFIC NOTES, NUMBER 38-9 Monthly Publication
L. E. Shaffer Sep. 1984 66 p
(AD-A145683; ESN-38-9) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists travelling in Europe may also be invited to author an ESN article. Author (GRA)

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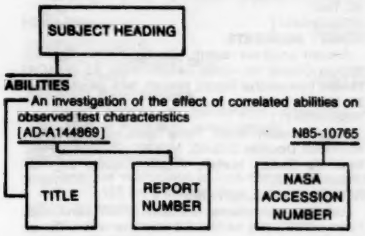

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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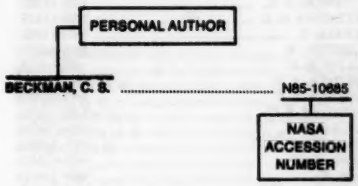

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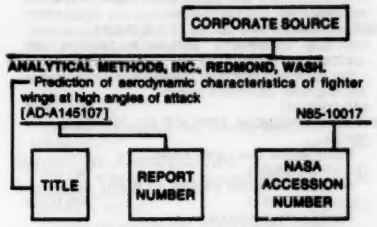

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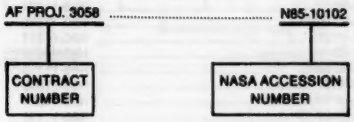

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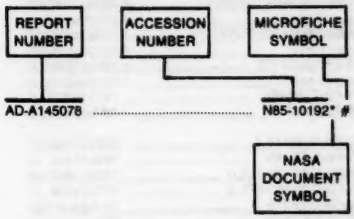

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